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EDUCATIONAL DEPARTMENT.

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PROSPECTUS.

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EDUCATIONAL DEPARTMENT.

PROSPECTUS FOR 1898;

CONTAINING

Syllabi or Outline Courses of Study,
Regulations for Examinations,
Suggestions from the International Examiners,
Examination Questions of 1898, Etc.

NEW YORK:
THE INTERNATIONAL COMMITTEE
YOUNG MEN'S CHRISTIAN
ASSOCIATIONS.

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Arithmetic, Bookkeeping, Civil Government, Canadian Constitution, Free-hand Drawing, Architectural Drawing, Mechanical Drawing, Carpentry, Algebra, Geometry, Hygiene, Electricity, Applied Mechanics, English, Asssociation City Council, Suggestive Questions in Business Law, Physics, Chemistry ..

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HISTORY OF THE NEW MOVEMENT.

The origin of this movement of the association for more definite, unified and standard courses of study, as represented in this pamphlet, was seen during 1893-94, in the publication by the International Committee of a few outlines and suggested courses.

This was followed in 1895 by a request from the Educational Conference of the International Convention for an experimental international examination. In response to this, questions were prepared in two subjects, Arithmetic and Mechanical Drawing, based on the previously published outlines, and our first international examinations held in April, 1896.

In the meantime a careful study had been made of the systems for improving definite and systematic class work, as found in successful operation by the New York State Board of Regents, and the State High School Board of Minnesota. A personal investigation of the three successful systems of similar encouragement for definite evening class work in England was made by the secretary of the committee.

The success of our first examination in April, 1896, led to the organization of the movement of standard courses maintained by international examinations as we have it to-day, and the publication of the first Prospectus, in July, 1896. That pamphlet contained the syllabi or outline courses of study, both elementary and advanced, in ten fundamental and most widely used subjects,—Arithmetic, Bookkeeping, Civil Government, Architectural Drawing, Mechanical Drawing, Free-hand Drawing, Carpentry, Physiology, Electricity, and English. The courses of study were prepared by the board of international examiners,—one experienced, recognized authority for each subject. They represent the combined wisdom of the best evening school work, much study of the problems and conditions involved, and thus far have proven very successful.

April 5-10, 1897, were held the second annual examinations. In these examinations eighty-four associations participated. Seven hundred and thirty-two papers marked seventy-five or above by the local authorities were received by the International Committee, and five hundred and sixty-six of these were passed by the international examiners. This was the first widespread general examination covering a number of subjects, and the results were highly creditable alike to the students, teachers, and the associations. This movement had begun to attract favorable attention, and the results of the examination being better than expected, the committee added five subjects to the Prospectus of 1897, which was to be the basis of work for the school year '97-'98. These subjects were Algebra, Geometry, Applied Mechanics, Canadian Constitution, and Association City Council. To the last subject especial attention was directed as a means of improving the results of our club work and literary society efforts, and at the same time cultivating a deeper interest in problems of civil and municipal government.

The original international examiners consented to serve during the next year. Their valuable suggestions, based on experience with the students' papers, together with the actual questions used in the examinations in 1897, were published in the Prospectus of July, 1897.

In the week March 28-April 2, 1898, the third annual examinations were held. They were participated in by one hundred and two of the Young Men's Christian Associations, including all of the leading organizations. Nine hundred and sixteen papers marked seventy-five or above were received by the International Committee, and seven hundred and fifty of these were passed by the international examiners. In addition to these, and for the first time in their history, the Young Women's Christian Associations participated in these examinations, observing the same regulations and conditions as the young men. Sixteen of their associations participated, and the committee received thirty-five papers marked seventy-five or above, of which twenty-nine were passed by the examiners. The complete report of these examinations for 1898 will be found in the Annual Report of the Educational Department for 1898.

This third annual Prospectus is issued with the conviction that the past three years' experience has shown the wisdom of this movement. It has ceased very largely to be an experiment and is recognized by all, both in and out of the association, as the most efficient means at our disposal for the encouragement and efficient improvement of our evening class work. Three new courses are added this year. They are Business and Commercial Law, Physics, and Chemistry. For these subjects, exceptionally strong men have been secured as international examiners.

The general plan of the work for the coming year is the same as that for the past. So much favorable attention is being created for this movement that the faculties of sixty leading colleges and universities of the United States have extended cordial recognition to our international certificates. A year ago this recognition was given by only fifteen institutions. The present list includes ten state universities, ten state colleges, fifteen or more technical and industrial institutions, and the remainder denominational colleges and universities. The international certificate, granted on successful completion of a subject, permits a student to receive credit for entrance in these institutions as far as such requirements are covered by the courses of the Prospectus.

The full aim is to encourage the students, to aid associations in planning more definite courses of study, to raise the efficiency of the work done in each subject to a recognized standard, and thereby greatly improve this department and make the association a much stronger factor of Christian usefulness in the community.

While this general plan for creating and maintaining a standard for evening school work has to its credit more than a quarter of a century of successful experience in Great Britain, yet it is comparatively new with us in America.

The plan may be modified in its various details when such changes are seen to bring better results. The committee is desirous of obtaining suggestions and helpful criticism from any who have had valuable experience.

The associations are again asked to coöperate as generally as possible in carrying out these plans for advancing and strengthening the educational work. Every general secretary, educational officer, and teacher should become thoroughly familiar with the plan and the regulations governing the examinations. The diversity in the circumstances, facilities, and methods of the different associations renders it essential that both the *letter* and the *spirit* of these regulations and suggestions be faithfully carried out. The success thus far only indicates the larger possibilities of the future, if the associations enter this wide open door of opportunity.

Brevity of the Outlines.

It has been deemed wise by the committee and international examiners to cover only the essential principles—the fundamental topics of what may be considered a standard course in each subject. Candid reflection will show the wisdom of this position. There are many excellent courses in each subject pursued with equally satisfactory results; yet in all of them the basal principles are the same. Hence the policy adopted by the committee for a general movement must allow all possible freedom of operation of the two necessary conditions of success—i. e., the specialization for local needs, and the essential scope for the individuality of the teacher. It is therefore deemed unwise at present to go further into detail in the courses for this Prospectus, but rather encourage each association to extend these brief outlines to meet its own local circumstances.

Text Books.

For the same reason the attention of all is called to the four or more text and reference books in each subject which follow the syllabus. These are the ones found in widest and most successful use in evening class work. No single text book is adopted to the exclusion of all others. Each teacher is advised to select the text through which he can accomplish the best results in line of the standard syllabus, and consistent with local conditions. While text books may serve as guides, none should be slavishly followed.

In our work, with the earnest young men in our classes, the short time at their disposal, and the necessity for greatest help being given them in the shortest possible time, the committee places extreme emphasis on the following suggestions for all courses:

1. Every effort should be made to lead students *to think for themselves* and thus develop individual power and ability.

2. Lead the students to see the *reasons* for each step.

3. Help them to formulate rules and principles naturally and inductively, from a familiarity with the operations which these rules and principles describe.

4. Lead students not only to understand thoroughly, but to acquire the ability to *apply* accurately the princi-

ples of each subject as related to the practical duties of life.

As a further aid to the associations and teachers, the sets of questions used in the last examinations are published, indicating approximately the way the syllabi are covered in the examinations.

Length of Course.

While neither the definite number of lessons nor the length of time required for the different courses is specified, yet in the average subject an elementary course implies one season's work and usually may be covered in from thirty-five to forty-five or more lessons, depending on the age and ability of the students and the methods of the teacher. Similarly the advanced course will usually imply two or more seasons' work. It is recommended that at least six months of evening class work be planned for, with two recitations per week in the average subject, and, as far as possible, that the course be arranged to be in running order by October 1 and continue at least till the international examinations are held, and as much longer as found profitable.

The examinations will usually be held during the first full week of April. For the year 1899, they will be held in the week beginning April 3.

It is recommended that the students who have covered the ground represented by the syllabus in any subject by April 1, be urged to participate in the international examinations. Do not be discouraged if at the close of a season there are but few such students.

International Examiners.

The syllabi or outline courses herein presented were prepared under the direction of the following gentlemen, each of whom is an authority in his special subject:

Hamilton W. Mabie, *The Outlook*, New York.

Thomas M. Balliet, Superintendent of Schools, Springfield, Mass.

Frederick B. Schenck, President Mercantile National Bank, New York City.

Herbert B. Adams, Johns Hopkins University, Baltimore, Md.

Walter S. Perry, Director Art Department, Pratt Institute, Brooklyn.

A. D. F. Hamlin, School of Mines, Columbia College, New York.

Charles R. Richards, Director of Manual Training, Teachers College, New York.

David F. Graham, Educational Department, Association Training School, Springfield, Mass.

Edwin J. Houston, Consulting Electrical Engineer, Philadelphia.

Luther Gulick, Director Physical Department, Association Training School, Springfield, Mass.

Herbert B. Ames, President Montreal Association.

Wooster W. Beman, Professor of Mathematics, University of Michigan.

Isaac Franklin Russell, New York University.

John F. Woodhull, Teachers College, New York.

SYLLABI OF THE COURSES.

Arithmetic.

SYLLABUS OF ELEMENTARY COURSE.

Fundamental operations, fractions, common and decimal, compound or denominate numbers, omitting division, and their practical applications. Percentage, interest, discount, profit and loss, taxes, and such other topics and sub-topics as are usually considered under the head of elementary, commercial, or simple business arithmetic.

SYLLABUS OF ADVANCED COURSE.

In addition to the above there should be included exchange, fire insurance, life insurance, banking, partnership, stocks and bonds, square root and its applications, literal arithmetic; or elementary principles of algebra as applied to arithmetic, metric system, simple mensuration, and such other topics and sub-topics as are usually considered a part of higher or complete commercial and mechanical arithmetic.

In connection with this subject the following suggestions are made: (a) The aim should be to lead the student to see a reason for every step, to make practical applications of every principle taught, in order to develop in him the power of independent thought. (b) The fundamental principles of each topic should be very thoroughly taught by means of simple problems. Time should not be wasted on arithmetical puzzles. (c) Obsolete topics in compound numbers should be omitted, and the actual weights and measures should be used, especially in teaching the metric system. (d) The student should be led to formulate rules, so far as rules are necessary, after having been made familiar with the processes which the rules describe. (e) Definitions should never be learned from books. The student should learn, if possible, in an objective way or through an illustration, what the thing to be known is, and then he should be led to define his own thought. His definition will be correct when his thought is accurate. It is the process of thus formulating a definition or a principle that is educationally valuable. Many definitions in the older arithmetics are wholly needless. It is a mistake to assume that a student does not know a thing unless he can give a technical definition of it. (f) Students should be trained to write out neatly and clearly the various steps in the solution of a problem, avoiding needless details. Such training is a very good discipline in systematic, consecutive thinking and develops habits which are of practical value in other lines of work. In examinations these points should be emphasized along with other essentials.

TEXT AND REFERENCE BOOKS.

Grammar School Arithmetic. Wentworth. (Ginn & Co., Boston.)

Every Day Business. M. S. Emery. (Lee & Shepard, Boston.)

Higher Arithmetic. Beman & Smith. (Ginn & Co., New York.)

New Packard Commercial Arithmetic. Packard. (S. Packard & Co., New York.)

Complete Arithmetic. (Williams & Rogers, Rochester, N. Y.)

The New Arithmetic. Seymour Eaton. (D. C. Heath & Co., Boston.)

The New Business Arithmetic. (O. M. Powers, Powers Building, Chicago, Ill.)

Bookkeeping.

Qualifications of a good bookkeeper; 1st, Accuracy; 2d, Neatness; 3d, Speed.

SYLLABUS OF ELEMENTARY COURSE.

1. Preliminary: Meaning and application of simple mercantile terms, as cash, checks, drafts, notes, receipts, statements, bills, invoices, account-sales, etc. Simple rules and principles for debiting and crediting accounts.

2. Books: Check book, bank pass book, day book, journal, cash book, ledger.

3. Accounts: Cash, personal property, bills payable, bills receivable, merchandise, accounts of expense, labor, interest, etc., which show simply a profit or loss.

4. Practice work: (a) Opening books, journalizing, and posting in double entry form a set or sets of accounts—as found in the text books or given by the teacher—involving simple transactions of general and varied business interests. (b) Closing books, trial balances, statements. (c) Bank dealings, opening a bank account, deposits, collections, checks, balancing and proving bank account and cash book.

SYLLABUS OF ADVANCED COURSE.

1. Mercantile terms, rules and definitions: (a) Their meaning and application: Cash, checks, receipts, notes, bills, bullion, drafts, accounts, statements, invoices, account-sales. (b) Rules and principles of debit and credit for all forms of business transactions and accounts, journalizing, posting.

2. Books: Journal, cash book, ledger, bill, invoice, sales, and other special books.

3. Accounts: For different lines of business, under whatever classification—cash, personal, property, bills payable and receivable, merchandise, profit and loss, capital, etc.

4. Business practice: (a) Opening set of books, journalizing, posting series of transactions involving the different kinds of accounts, the use of the various books, and the numerous commercial, manufacturing, industrial and financial business interests. (b) Examples for column journal, and specially ruled cash books and ledgers for particular lines of business and for both double and single entry bookkeeping. (c) Closing books—trial balances, statements, inventory, resources, liabilities, net worth. (d) Bank dealings—deposits, collections, discounts, loans, checks, endorsements. (e) Foreign exchange—imports, duties and exports. (f) Systems for checking postings, proving bank pass book and cash book. (g) Short methods and arrangement of accounts. (h) Advanced practice, special accounts for firm or corporation, purchases and sales, manufactures, discounts, interest, and other complex accounts for profit and loss.

TEXT AND REFERENCE BOOKS.

Office Routine and Bookkeeping. (Williams & Rogers, Rochester, New York.)

Business Forms and Accounts; Exercise Manual. Seymour Eaton. (American Book Co., New York.)

Complete Bookkeeping. Foote. (W. H. Foote, Y. M. C. A., Cleveland.)

Ellis System of Actual Business. (Ellis Pub. Co., Battle Creek, Mich.)

Montgomery's Modern Bookkeeping. J. L. Montgomery. (Maynard, Merrill & Co., New York.)

The Complete Accountant. (O. M. Powers, Chicago.)

Business and Commercial Law.

SYLLABUS OF ELEMENTARY COURSE.

Introduction, Origin and General Principles.
Contracts and their Construction.
Consideration in the Law of Contracts.
Parties Incompetent to Contract.
Illegal Contracts.
Parent and Child.
Husband and Wife.
Master and Servant.
Agency.
Sales and Chattel Mortgages.
Negotiable Paper.
Partnership.
Corporations.

SYLLABUS OF ADVANCED COURSE.

Wills and Inheritance.
Executors and Administrators.
Inn-keepers and Common Carriers.
Shipping.
Deeds, Mortgages and Leases of Real Property.
Torts affecting Property, Trespass, Conversion and False Pretences.
Insurance.
Suretyship.
Patents, Copyrights and Trademarks.
Bankruptcy and Insolvency.
Communication by Telegraph and Telephone.
Legal Instruments in familiar use.

TEXT AND REFERENCE BOOKS.

Commercial Law. Clark. (Maynard, Merrill & Co., N. Y.)
Business Law. (Williams & Rogers, Rochester, N. Y.)
Commercial Law. J. A. Lyons. (O. M. Powers, Chicago, Ill.)
Business Law. A. R. Weed. (D. C. Heath & Co., Boston and New York.)

Outline Study of Law. I. F. Russell. (Baker, Voorhis & Co., New York.)

Handbook of Business Law. E. E. Mull. (23d St. Br. Y. M. C. A., New York City.)

GOOD CITIZENSHIP.

The aim of these courses in government and political history for the States and the Dominion is to lead students to a practical applied knowledge of how public business is done; how and by whom laws are made and executed in the city, the state and the nation; how the taxes are levied and collected; how the government borrows money; how to become a citizen, etc. In brief, to lead the student to feel and interpret in daily life the *spirit* of the common law, which to know is to respect.

I.—Civil and Municipal Government.

SYLLABUS OF ELEMENTARY COURSE.

1. The origin of the state: Types of government; civil government; civil and political rights.

2. The Constitution of the United States: History of its adoption; differentiation of functions into legislative, executive and judicial.

3. The National and State governments: Powers exercised by the states inherent, powers exercised by the national government delegated; implied powers; concurrent powers.

4. Citizenship: Suffrage; eligibility to office; elections.

5. Composition and organization of Congress: Legislation by committees; the powers of Congress.

6. The Executive Power: The election of President and Vice President; powers and duties of the President; the executive departments.

7. The Judicial Power: Organization and jurisdiction of the Federal courts; constitutional law.

8. The Constitution at work: Administrative law: separation of powers; checks and balances; the unwritten constitution.

9. National Finances: Public debt; bonds; note issues; legal tender; multi-form currency.

10. National Banking: History; the present National banking system, its advantages and defects.

11. The State Governments: State constitutions; sphere of state activity.

12. Local Government: The township; the county; the village; the borough; the city; general characteristics and duties of local government.

13. The City in History: The ancient city-state; the mediæval free city; the modern industrial city; its rapid growth.

14. Municipal Reform: Political and social evils; the boss and the ring; betterment; municipal leagues and good government clubs.

15. City Charters: Organization of city government; charter and code; the mayor and council; responsibility and civil service; ward lines.

16. The City and the State: The city as a public corporation; the problem of control; types of control (administrative, legislative and judicial); special legislation; home rule.

17. Municipalization: Theory and practice; range of functions (social, business, governmental); sphere of public and private initiative; municipal ownership, operation and control of monopolies.

18. Public safety: Police, lighting and fire departments; sanitation (water, drainage and street cleaning).

19. Municipal Finances: Expenditure subject to state regulation; sources of assets; basis of taxation and assessment; indebtedness.

20. Education and Charity: Organization and administration of schools; industrial and technical education; libraries and art galleries; charities and corrections; housing of the poor.

TEXT AND REFERENCE BOOKS.

Civil Government in the United States. John Fiske. (Houghton, Mifflin & Co., Boston.)

The American Government. B. A. Hinsdale. (The Werner Co., Chicago.)

Our Government. Macy. (Ginn & Co., Boston.)

Municipal Problem. F. J. Goodnow. (Putnam & Co., New York.)

Municipal Government in Great Britain. Albert Shaw. (The Century Co.)

The American Citizen. Dole. (D. C. Heath & Co., Boston.)

The Study of City Government. D. F. Wilcox. (Macmillan & Co., Boston and New York.)

II.—American Politics.

SYLLABUS OF ELEMENTARY COURSE.

1. Divisions in the Federal Convention: Compromises of the Constitution; ratification by the states; federalists and anti-federalists.

2. Organization of the Government (1789-1793): The first cabinet; opposing views of Jefferson and Hamilton; strict and loose constructionists.

3. Federal Supremacy (1793-1801): The war between France and England; American neutrality; the alien and sedition laws; the Virginia and Kentucky resolutions.

4. Republican Supremacy (1801-1809): The political revolution of 1801; the civil service; the repeal of the judiciary act; purchase of Louisiana; the Burr conspiracy; the Napoleonic wars; the embargo.

5. Period of the War with England (1809-1815): Difficulties with England; non-intercourse laws; opposition to the war in New England; the Hartford convention; extinction of the Federal party.

6. The period following the war (1815-1824): Economic reorganization; the second United States bank; the first protective tariff (1816); the purchase of Florida; the Missouri Compromise; the Monroe Doctrine; the tariff of 1824.

7. Reorganization of parties (1824-1829): The election of 1824; internal improvements; formation of the National Republican and Democratic parties; the tariff of 1828; opposition to Adams; the triumph of the people.

8. The introduction of a new era (1829-1833): President Jackson; his advisers; the spoils system; internal improvements; Foote's resolution; the tariff of 1832; nullification; the compromise.

9. The war against the bank (1829-1837): Constitutionality of the bank; Jackson's hostility; the fight for recharter; removal of the deposits; distribution of the surplus; the specie circular.

10. Period of financial depression (1837-1841): The panic of 1837; the independent treasury; anti-slavery movement.

11. The Whig party in power (1841-1845): The rupture with Tyler; the tariff of 1842; the annexation of Texas.

12. The Mexican war (1845-1848): The acquisition of new territory; the Wilmot proviso; formation of the Free Soil party.

13. The compromise of 1850: The whig party in power (1849-1853); squatter sovereignty; California; Clay's compromise.

14. Territories opened to slavery (1853-1857): The democratic

party in power; the Kansas-Nebraska bill; repeal of Missouri compromise; rise of Republican and American parties.

15. Secession (1857-1861): The Dred Scott case; the Lincoln-Douglas debate; John Brown's raid; secession.

16. The Civil War (1861-1865): Period of hesitation; opening of hostilities; the Republican party in power; the emancipation proclamation; questions of finance.

17. Reconstruction (1865-1870): The problem of reconstruction; policy of Andrew Johnson; opposition of Congress; impeachment of the President.

18. Return to normal conditions (1870-1876): Reconstruction by congress; election troubles in the South; intervention of Federal troops; the disputed election of 1876.

19. Questions of financial legislation: The Bland-Allison act of 1878; the Sherman act of 1890; repeal of the Sherman act, 1893; the silver issue of 1896.

20. Tariff legislation: Review of earlier tariff history; war tariff; reduction of the tariff becomes a leading question; the McKinley bill; the Wilson bill; the Dingley bill.

TEXT AND REFERENCE BOOKS.

American Politics. Alex. Johnston. (Henry Holt & Co., New York.)

Epochs of American History. A. B. Hart. Vol. 2, Formation of the Union; Vol. 3, Division and Reunion. Woodrow Wilson. (Longmans, New York.)

III.—The Canadian Constitution.

SYLLABUS OF ELEMENTARY COURSE.

1. Definitions: Canadian development divided into five periods: (a) The French régime. (b) English rule. (c) Representative institutions introduced and developed. (d) Period of responsible government. (e) Federal union and subsequent progress. (*5 evenings.*)

2. The Imperial Government: The executive power, legislative power, judicial power, nature of imperial control over Canada. (*1 evening.*)

3. The Government of the United States: Periods of American history, the American system in its executive, legislative, and judicial departments. State and local governments, influence upon the Canadian constitution. Comparison between certain features of the American and Canadian systems. (*1 evening.*)

4. The Dominion Government: (a) The Executive power. (b) The Legislative power. (c) The Judicial power. (*6 evenings.*)

5. Revenue and expenditure. (*1 evening.*)

6. Militia and defence. (*1 evening.*)

7. Canadian political parties, their history, leaders and platforms. (*2 evenings.*)

8. Canada's future destiny, the possible paths open, their advantages and disadvantages. (*1 evening.*)

9. The Dominion right of suffrage. (*1 evening.*)

10. Citizenship. Its duties and responsibilities. (*1 evening.*)

(*20 evenings for the course.*)

SYLLABUS OF ADVANCED COURSE.

1. History of this Province. (*2 evenings.*)

2. Study of the B. N. A. Act concerning matters belonging to provincial control. (*1 evening.*)

3. The Government of a Province: Executive, legislative, judicial, the legislature in session. (*6 evenings.*)

4. The Provincial courts of law: Trial of civil and criminal cases. (*2 evenings.*)

5. The provincial revenue and expenditure. (*2 evenings.*)

6. The public school system in this and in other Provinces. (*2 evenings.*)

7. Government of the Northwest territories. (*1 evening.*)

8. Municipal government in the Provinces. (*2 evenings.*)

9. The Provincial election laws. (*1 evening.*)

10. Our Province: Its advantages and resources. (*1 evening.*)

(*20 evenings for the course.*)

TEXT AND REFERENCE BOOKS.

How we are Governed. A. de Foublanque. (Frederick Warne & Co., New York.)

Outline of Civil Government. Higby. (Lee & Shepard, Boston.)

Manual of the Constitution of Canada. J. G. Bourinot. (Dawson Bros., Montreal.)

How Canada is Governed. J. G. Bourinot. (Copp Clark Co., Toronto.)

Lectures on Canadian Political History. H. B. Ames. (Association, Montreal.)

Free-Hand Drawing.

SYLLABI FOR ELEMENTARY AND ADVANCED COURSES.

The work should include drawing from models, objects, casts, nature, and from the best examples of historic ornament.

In the elementary course the topics should be of such a character and so taught as to give the pupil the ability to make a free and correct drawing of any simple ornament, especial attention being given to Egyptian, Greek, and Roman styles, and to draw in outline the appearance of rectangular and cylindrical objects and groups of simple objects.

The advanced course should include further practice in perspective principles as illustrated in the appearance of objects; the exterior of a house, or the interior of a room; sketching, light and shade drawing, cast drawing, and more extended work in good examples of ornament, including the Saracenic, Gothic, and Renaissance ornament.

The examination in the elementary course will require in addition to the written work, drawings in *outline* to a larger or smaller scale than the object, cylindrical and rectangular models that may be furnished or described, common objects or simple groups of objects, including the top of the stand, table, or board on which they rest, and drawings of standard examples of Egyptian, Greek, or Roman ornament.

The examination in the advanced course will include the principles of the elementary course and the representation of objects, groups of objects, and casts in *light and shade*, and examples of Saracenic, Gothic, and Renaissance ornament.

TEXT AND REFERENCE BOOKS.

Teacher's Manual, Part 4, Prang's Complete Course. (Prang Educational Co., Boston.) Chapters on representation and decoration are particularly recommended.

The Essentials of Perspective. L. W. Miller. (Scribner & Sons, New York.)

Lessons in Decorative Design. F. G. Jackson. (Chapman & Hall, London.)

Sheets of Historic Ornament. (L. Prang & Co., Boston.)

Architectural Drawing Leading to Building Construction.

SYLLABUS OF ELEMENTARY COURSE.

1. Drawing materials and instruments, their proper use and care.
2. Practice with ruling pen; section-lining and crosshatching.
3. Simple geometrical problems bearing upon architectural drawing.
4. Projections; front, top, side views and sections of the simple and compound solids occurring most frequently in architecture,—cubes, prisms, pyramids, cylinders, cones, etc.,—in different combinations, to develop the understanding of architectural form.
5. Developments and intersections of surfaces and solids.
6. Simple scale drawings, in plan, elevation and section, with a minimum of detail, of small buildings, such as a two-room cottage, a barn, a small two-story house, or a small chapel. Show thickness of walls, roofs and floors, and proper indication of doors, windows, fireplaces, stairs, and railings.
7. Elementary details of construction, as bonding of masonry and brickwork, framing details of sill and water-table, of eaves, floors, etc.
8. Occasional practice in free-hand drawing of objects or figures which occur in the other exercises.
9. Frequent practice in simple lettering.

It is suggested that such technical applications of geometry as are involved in detailing and plotting out hip and valley rafters, stair-rails and strings and the like, be not undertaken under general architectural drawing, but confined to special courses for carpenters and stair builders, or to other special students.

SYLLABUS OF ADVANCED COURSES.

1. Working plans and elevations, to 1-8 inch and 1-4 inch scales, of a frame house and of a brick house, and tracings of the same on cloth. These drawings should be carefully lettered and figured.

2. Working up scale drawings from free-hand sketches, or from dictation.

3. Building details: Framing in wood; masonry and brickwork; details of framing and finish of doors, windows, fire-places, roofs, stairs, etc.; full size and to 1 inch scale.

4. Architectural elements; typical forms of doors, windows, roofs, balustrades, vaults, and ceilings.

5. The orders of architecture: The general design and proportions of the Tuscan, Doric, Ionic, and Corinthian orders; columns, pilasters, pediments and arches.

The proportions are best studied in terms of the lower diameter of the column and fractions of the same. The Vignola system of modules and parts is too artificial and minute for practical use.

6. Free-hand sketches of architectural ornament and decorative detail.

7. Practical lettering, the correct formation and use of simple types of large and small Roman letters and italics.

During the course and by means of talks, recitations, or otherwise, the teacher should lead the student to a practical knowledge of the character of ordinary building materials, and of the dimensions and methods of construction in common use. The purpose of these talks is to impart those elementary notions of the mechanics of building by means of which the intelligent pupil may solve the ordinary problems arising in everyday practice. It is urgently recommended that, wherever possible, the students be induced to study plane and solid geometry in connection with this course, unless already proficient therein.

The teacher should keep close watch upon all the lettering of the students, and the general execution of their work, refusing to tolerate careless or slipshod results.

TEXT AND REFERENCE BOOKS.

Architectural Drawing. C. F. Edminster. Pratt Institute course in text book form. (Prang & Co., Boston.)

Practical Lessons in Architectural Drawing. Tuthill. (W. T. Comstock & Co., New York.)

Babcock's Elementary Architecture.

Building Construction and Drawing. C. F. Mitchell. (The Polytechnic, Regent Street, London.

Mechanical Drawing.

With Notes on Machine Construction.

SYLLABUS OF ELEMENTARY COURSE.

1. Drawing materials, their use and care.
2. Front, top, and side views of simple geometrical solids—sections, conventional lines, dimensions.
3. Working drawings of simple objects with dimensions.
4. Development of surfaces, plane and curved; patterns; intersections of surfaces.

(These last two topics may be extended in a special course for sheet metal workers, tinsmiths, etc.)

5. Screw threads, true and conventional; bolts and nuts; working drawings of machine details, full size and to scale. preceded by free-hand dimensional sketches.
6. Pulleys, clamps, wrenches, couplings,

(Working drawings or working sketches should contain all dimensions necessary to show the facts of form.)

SYLLABUS OF ADVANCED COURSE.

1. Working drawings of machine details with dimensioned sketches continued.
2. Valves, shafting details, etc.
3. Full set of working drawings, ready for the shop, of a complete simple machine, such as a bench lathe or small engine.
4. Tracings and blue prints.

During the course, by means of talks, illustrated by models, specimens, or blackboard sketches, the teacher will lead the student to a knowledge of the character and strength of the materials used, the simple mechanical principles involved, the workshop processes employed, and the accepted method of construction in the various models or parts of machines drawn.

TEXT AND REFERENCE BOOKS.

Mechanical Drawing. L. Roullion. Pratt Institute course in text-book form. (Prang Educational Co., Boston.)

Elements of Mechanical Drawing, Parts I. and II. G. Anthony. (D. C. Heath & Co., Boston.)

Elements of Machine Drawing, Part III. G. Anthony. (D. C. Heath & Co., Boston.)

Machine Drawing, Parts I., II. and III. Thorne. (Williams, Brown & Earle, Philadelphia.)

Mechanical Drawing. Chas. F. Jackson. (Lippincott & Co., Philadelphia.)

Carpentry.

SYLLABUS OF ELEMENTARY COURSE.

1. Only the simple tools are required for this course. It includes instruction in the care and use of knife, saw, chisel, gouge, hammer, small plane, scale, gauge, auger-bit, file.
2. The structure and composition of woods.
3. Straight cuts, or with the grain of the wood; the care and use of tools required in the same.
4. Oblique and cross cuts, care and use of necessary tools.
5. Boring with and across the grain. Use of simple bits.
6. Straight and cross chiseling. Gouging, straight and curved.

This course is possible in all associations where elementary wood working is taught, and may be equally well covered by the Russian, German, Sloyd, or combination systems.

SYLLABUS OF ADVANCED COURSE.

1. This course requires most of the tools used in carpentry and joining, and includes instruction in the care and use of same.
2. Seasoning, shrinking, and warping of woods.
3. Cutting to given dimensions with edges true, reducing warped to plain surfaces.
4. Value of working face, splices, mortise and tenon, dovetail joints, with fastenings for same.
5. Framing and paneling, flat and raised panels, beads, mouldings, fillets.
6. Fastenings: Wedges, keys, dowels, nails, screws, glue.
7. Finishing: When wood is to be painted, when wood is to be varnished, cleaning surface, raising grain, filling grain, painting, oiling, and shellacing.

The examinations in this subject will include written answers to questions. Also working sketches with dimensions and the actual construction of a simple joint or article.

TEXT AND REFERENCE BOOKS.

Bench Work in Wood. (Pratt Institute, Brooklyn, New York.)

Bench Work in Wood. Goss. (Ginn & Co., Boston.)

Exercises in Wood Working. I. Sickle. (American Book Co., New York.)

How to use Wood Working Tools. (D. C. Heath & Co., Boston,)

Fifty Lessons in Wood Working. Upham. (E. L. Kellogg, New York.)

Algebra.

SYLLABUS OF ELEMENTARY COURSE.

1. Introduction: Literal notation, preliminary definitions, signs and symbols, evaluation of literal expressions.
2. Fundamental Operations: Addition, subtraction, multiplication, division, associative law, commutative law, distributive law, index law, detached coefficients, synthetic division.
3. Simple Equations: Transformations, solution of problems.
4. Factoring: Divisors and multiples; remainder theorem.
5. Fractions: Reduction, addition, subtraction, multiplication, division, fractional equations.
6. Simultaneous Equations of the first degree.

So far as possible the results of all operations should be checked by considerations of homogeneity and symmetry, by substitution of arbitary values, or by reversing the operations, thus rendering the pupil self-reliant.

SYLLABUS OF ADVANCED COURSE.

1. Simultaneous Equations: Two or more unknown quantities, elimination, determinants, solution of problems.
2. Involution and Evolution: Binomial formula, theory of exponents, index law, powers and roots.
3. Radicals: Reduction, fundamental operations, rationalization, imaginary expressions.
4. Quadratic Equations: Solution by factoring, completing the square, theory and properties, simultaneous quadratics.
5. Binomial Theorem: With any exponent.
6. Ratio and Proportion.

7. Progressions.
8. Series: Convergence and Divergence.
9. Logarithms.

TEXT AND REFERENCE BOOKS.

Elementary Algebra. Hall and Knight, as revised by Sevenoak. (The Macmillan Co., New York.)

School Algebra. White. (American Book Co., New York.)

Academic Algebra. Taylor. (Allyn & Bacon, Boston.)

School Algebra. Wentworth. (Ginn & Co., Boston.)

Plane Geometry.

1. Introduction: Preliminary definitions, axioms, postulates.
2. Rectilinear Figures: Triangles, parallels and parallelograms, problems, loci.
3. Equality of Polygons: Pythagorean theorem, problems, practical mensuration of surfaces.
4. Circles: Angles, chords and tangents, secants, inscribed and circumscribed figures.
5. Methods of attacking original theorems and problems.
6. Ratio and Proportion: Theory of limits, lines cut by parallels, lines cut by a circumference, similar figures.
7. Mensuration of Plane Figures: Rectangles, triangles, regular polygons, the circle.

Great stress should be laid on original work, figures should be accurately drawn, and exact reasoning in every case required.

Experience proves that the work must be made as concretely practical as possible. Geometrical truths, constructions and reasoning in their application and relation to every day problems, are essential.

The closest sympathetic connection between this subject and drawing, especially mechanical and architectural drawing, is also necessary; the subjects are mutually inter-dependent. Above all, lead the pupil to the ability to think logically and reason wisely for himself, to stand on his own feet.

TEXT AND REFERENCE BOOKS.

Plane and Solid Geometry. Beman & Smith. (Ginn & Co., Boston.)

Plane and Solid Geometry. Wentworth, (Ginn & Co., Boston.)

Plane and Solid Geometry. Wells. (Leach, Shewell & Sanborn, Boston.)

Elements of Geometry. Macnie. (American Book Co., New York.)

Applied Mechanics.

SYLLABUS OF ELEMENTARY COURSE.

1. Force: Rest and motion, measurement of a force, composition of forces, laws of motion.
2. Simple Machines: Law of machines, the lever, wheel and axle, pulleys, wedge, screw; mechanical advantages.
3. Work and Energy: Measurement, horse power, transformation of energy.
4. Friction: Laws, reduction in machines.
5. Materials: Wood, iron and steel, their properties and qualities for different purposes, strength, action under tensile, compressive, or lateral stress.

TEXT AND REFERENCE BOOKS.

Elementary Mechanics. W. G. Peck. (American Book Co., New York.)

Applied Mechanics. Cotterill and Slade. (Macmillan & Co., New York.)

Many of the topics in the above course will be found well treated in the standard text books on the subject of Physics.

Electricity.

SYLLABUS FOR BOTH ELEMENTARY AND ADVANCED COURSES.

For the elementary course the topics will be such of the following and so taught as may well be covered in the sample set of questions for the elementary examination, or comprehended in the first suggested text book.

1. Electrical Effects: Magnetic, mechanical, thermal, luminous, electrolytic, etc.; force, work, potential and kinetic energy; activity; the foot-pound, dyne, erg; intake and output; efficiency.
2. Electromotive Force and Electric Potential: The volt, coulomb,

joule; the watt and horse-power; continuous and alternating electromotive force.

3. Resistance: Restivity, joint resistance; conductance, conductivity; international ohm; conductors and insulators; variation of resistivity with temperatures; metallic and grounded circuits; the Wheatstone bridge; shunts or derived circuits.

4. Current: Quantity and flow of electricity; international coulomb, ampere and ampere-hour; types of electric currents; ammeters, galvanometers, voltmeters; density of electric current.

5. Circuit: Series, multiple, multiple-series, series-multiple.

6. The Voltaic Cell: Voltaic elements, electrolyte, depolarizer, polarization; counter electromotive force; single and double fluid cells; open and closed circuit cells; standard cells; cost of electric current supply, voltaic batteries; electric capability; electro-chemical equivalents.

7. Magnetomotive Force: Magnetic flux paths; magnetic field; magnetic needle; magnetic saturation.

8. Magnetic Flux and Reluctance: Magnetic circuits, reluctivity; circuits, ferric, non-ferric, æro-ferric; law of magnetic circuit.

9. Electro-Magnets: Tractive and portative; tractive power; magnetizing effect of electric currents.

10. Induced E. M. F.: Varieties of; Fleming's hand rule for dynamos.

11. Dynamo Electric Machines: Armatures; electrical capability and efficiency; losses, limitations of output, heating, etc.; eddy currents; magnetic hysteresis; securing constant current or E. M. F.; computing output.

12. Electro-Dynamics: Electro-dynamic force; Fleming's hand rule for motors.

13. Electric Motor (continuous current type): Difference between dynamos and motors, interchangeability of; counter-electromotive force of motor; torque and speed; smooth and tooth-cored armatures.

14. Electric Heating: The caloric, British thermal unit; specific heat; electric cooking; electric welding.

15. Incandescent Lighting: Preparation of the filament; flashing process; mounting of filament; exhaustion of lamp chamber; luminous standard; efficiency of lamp; illumination and candle power.

16. Electric Arc Lighting: Voltaic arc carbons, cored and solid; luminous intensity; mean spherical candle power; automatic cutouts; arc lamp mechanisms.

17. Alternating Currents: Simple harmonic motion; alternation,

cycle, period; admittance, impedance, reactance; power-factor; alternators; transformers, step-up and step-down; multiphase currents and motors; power transmission.

18. Some Other Applications of Electricity: The telephone; the telegraph; the telautograph; electro-plating; electro therapeutics; rapid transit, trolley; storage and conduit systems; electric plants.

TEXT AND REFERENCE BOOKS.

Electrical Engineering Leaflets, Elementary grade. Houston & Kennelly. (The Electrical Engineer, New York.)

Electrical Engineering Leaflets, Intermediate grade. Houston & Kennelly. (The Electrical Engineer, New York.)

Elementary Lessons in Electricity and Magnetism. S. P. Thompson. (Macmillan & Co., New York.)

Elementary Manual of Magnetism and Electricity. Andrew Jamison. (Charles Griffin & Co., London.)

Hygiene;

Including First Aid and Physiology.

SYLLABUS OF ELEMENTARY COURSE.

1. Bone; joints, cartilage, ligaments, synovial membrane; fractures, dislocations, sprains.
2. The motor system.
3. The blood and circulatory organs, hemorrhage.
4. Respiration; asphyxia and drowning.
5. Alimentation and digestion; kidneys, bladder, skin, spleen.
6. Nervous system; unconsciousness, shock or collapse, and syncope or fainting; concussion and compression of the brain, apoplexy, or stroke of paralysis; intoxication, epilepsy, hysteria, and heatstroke or sunstroke.
7. Contusions and wounds; burns, scalds and frostbite; bandages and dressings; antiseptics, disinfectants, deodorants; poisons and poisoning.
8. Convulsions of children, tetanus, foreign bodies in eye, ear, nose, larynx, and pharynx; bed-sores, foot-soreness and chafing.
9. Transportation of the sick and injured.

SYLLABUS OF ADVANCED COURSE.

1. Physiology applied; the skeleton, the circulatory, respiratory, muscular, nervous and digestive systems and their functions in detail.
2. Personal hygiene, care of the body, food, exercise, baths and dress.
3. Influence of body on mind and character.
4. The reproductive system; its care, physical and spiritual relationships.
5. Care of the eyes, ears, skin, digestion, lungs, etc.
6. The use of stimulants and narcotics, tobacco, etc.
7. Public hygiene; the care of the streets, sewers, water supply, etc.
8. Spread of contagious disease, quarantine, disinfection.
9. Board of health; laws, inspection of milk, butter, meat, etc.

TEXT AND REFERENCE BOOKS.

First Aid in Illness and Injury. Pilcher. (Scribner's Sons, New York.)

First Aid to the Injured. Bowdich Morton. (Soc. of First Aid to the Injured, 105 East 22d street, New York.)

Our Bodies. Blaisdel. (Ginn & Co., Boston.)

Physiology and Hygiene. Hutchinson. (Maynard, Merrill & Co., New York.)

The Human Body. Martin. (Henry Holt & Co., New York.)

Confidential Talks to Young Men. L. B. Sperry. (The International Committee, 3 West 29th street, New York.)

Chemistry.

SYLLABUS OF ELEMENTARY COURSE.

1. Chemistry of the Air: Effects of excluding air from a flame; effects of air on iron at ordinary temperatures; at high temperatures; various ways of protecting iron from the action of the air; increase of weight when iron is acted on by the air; the weight of the product of a burning candle compared with the amount lost by the candle; portion of the air used up when anything burns in a closed vessel.

2. Oxygen: Preparation of oxygen; its action on charcoal at ordinary temperatures and at high temperatures; on sulphur, phosphorus, etc.; products of this action compared with those obtained by burning these substances in air; ordinary combustion; kindling temperature; heat of combustion; chemical energy; oxides; oxides in nature.

3. Hydrogen: Preparation by the action of an acid on a metal; comparison of its physical and chemical properties with those of oxygen; burning of hydrogen in oxygen or in air, and burning of oxygen or air in hydrogen; product of this combustion; formation of this product in ordinary combustion and in respiration; heat and chemical energy of the combustion of hydrogen.

4. Chemistry of water: Electrolysis of water; formation of water by passing hydrogen over heated oxides; composition of water by volume and by weight; decomposition of water by passing steam over heated metals or heated carbon; water gas; oxidation and reduction; natural waters; impure waters; tests and methods of purification.

5. Nitrogen and its Compounds: The nitrogen of the air; preparation of ammonia; its combination with water; mechanical mixtures and chemical compounds; preparation of nitric acid; use of sulphuric acid in making acids from salts; unstable character of nitric acid; unstable character of nitrogen compounds as illustrated by explosives and by all organic compounds containing nitrogen; unstable character of ammonium nitrate and of nitrous oxide; nitrogen peroxide and nitric oxide as oxidizing and reducing agents.

6. Chlorine and its compounds: Preparation of chlorine from bleaching powder; bleaching; disinfecting; preparation of chlorine from hydrochloric acid; formation of hydrochloric acid, by burning hydrogen in chlorine or chlorine in hydrogen; affinity of chlorine for metals; chlorides in nature; formation of hydrochloric acid by the action of sulphuric acid on common salt; its solution in water; action of hydrochloric acid on metals; formation of sodium chloride by the action of hydrochloric acid on baking soda; definite proportions; acids, bases and salts; chemical nomenclature; symbols and formulas; reactions; equations; effects of light, heat, electricity and solution on chemical action.

7. Bromine, iodine, and fluorine: Comparison with chlorine in methods of preparation, in properties and in compounds; etching on glass.

8. Sulphur and its compounds: Occurrence of sulphur in nature; extraction from its ores; its behavior at different temperatures; its

crystallization from a state of fusion and from solution; its amorphous condition; its affinity for oxygen; its comparatively low kindling temperature; its use in making matches; its affinity for metals; preparation of iron sulphide by heating sulphur and iron filings; preparation of hydrogen sulphide by treating a sulphide with sulphuric acid; the instability of hydrogen sulphide; its use as a reagent; tests for its presence in eggs, coal gas, sulphur spring water, vulcanized rubber, etc.; products of the combustion of hydrogen sulphide in air or in oxygen; the manufacture of sulphuric acid from sulphur dioxide; its importance; preparation of sulphur dioxide from sulphuric acid by means of copper; its bleaching properties; atomic theory; theory of valence.

SYLLABUS OF ADVANCED COURSE.

1. Carbon: The instability of organic things; their use as fuels; their liability to decay; the charring of organic substances; the affinity of charcoal for oxygen at ordinary and at high temperatures; products of the union; limewater test; presence of hydrogen in organic things as shown by the formation of water in combustion; relative kindling temperature of hydrogen and carbon; smoky flames; lampblack; destructive distillation; manufacture of illuminating gas; coke; formation of coal, petroleum, and natural gas; diamond; graphite; carbon as a reducing agent; its use in extracting metals from their ores; charcoal filters; oxidation and reduction products as illustrated in combustion, decay, the life processes of animals and plants, and destructive distillation from a retort or in the earth, carbon monoxide in coal fires; in water gas; marsh gas; ammonia from compost heaps; marsh gas in coal mines; fire-damp and choke-damp; carbon dioxide in respiration; comparison of respiration of animals and plants; use of hemoglobin and chlorophyl; ventilation; reason why carbon dioxide will neither burn nor support combustion; study of flames; heat and chemical energy of the combustion of carbon; application of this energy in doing mechanical work; fermentation by yeast; soaps.

2. Phosphorus and Arsenic: Characteristics of phosphorus and arsenic; affinity of phosphorus for iodine; for oxygen; use in making matches; allotropism as illustrated by phosphorus, carbon, sulphur, and oxygen; phosphoric acid and its salts.

Monobasic, dibasic and tribasic acids; acid, neutral and normal salts.

Properties of arsenious oxide; Marsh's test for arsenic; the nascent state as illustrated by the action of chlorine from aqua regia, sulphur from hydrogen sulphide, hydrogen in Marsh's test, the action of oxidizing and reducing agents; products of the complete combustion of hydrogen arsenide, carbon bisulphide, hydrogen sulphide and a hydro-carbon like kerosene; products of the incomplete combustion of the same when cool objects are brought into the flames; the affinity of oxygen for these elements in the free state compared with its affinity for them in the combined state.

3. Important metals and their ordinary compounds: A brief study of the properties of the following metals and a few of their ordinary compounds—potassium, sodium and (ammonium); calcium; zinc, copper, mercury and silver; aluminum and iron; lead and tin; platinum and gold.

Gunpowder; baking powder; hard water; mortar; glass; the smelting of ores; steel; porcelain; the common alloys.

TEXT AND REFERENCE BOOKS.

Elements of Chemistry. Shepard. (D. C. Heath & Co., Boston.)

Elements of Chemistry. Remsen. (Henry Holt & Co., New York.)

Introduction to Chemical Science. Williams. (Ginn & Co., New York.)

Laboratory Studies in Chemistry. Cooley. (American Book Co., New York.)

Physics.

SYLLABUS OF ELEMENTARY COURSE.

1. Matter and Force: Familiar illustrations that will develop ideas of the molecular constitution of matter and of molecular force, including such topics as the solid, liquid and gaseous states, and the relation of heat to these; cohesion; crystallization; capillarity; diffusion and osmose.

Simple and compound substances; physical and chemical changes; indestructibility of matter; the correlation of physics and chemistry.

Familiar illustrations and applications of the principles of momentum, gravitation and the three laws of motion; the composition and resolution of forces; the composition of parallel forces and the application of the principle to levers, pulleys, muscular movements, the wheel and axle, balances, devices for illustrating center of gravity and the stability of bodies; uniformly accelerated and retarded motion; the path of projectiles; the pendulum and its uses; the recoil of a gun; the motion of the rotary lawn-sprinkler.

2. Dynamics of Fluids: Pressure in liquids and gases; the barometer and its applications; transmission of the pressure exerted on fluids.

Application of principles to the siphon, pumps, springs, and artesian wells, methods of supplying cities with water, the hydrostatic press, pneumatic tubes.

Discussion of buoyancy and specific gravity.

3. Heat: Sources of heat, such as friction and chemical action; effects of heat on solids, liquids, and gases in producing expansion, liquefaction, and vaporization; measurement of heat with reference to temperature and quantity; radiation, and diffusion of heat in solids, liquids and gases by conduction and convection.

Discussion of principles as illustrated in such topics as ventilation, heating of houses by steam, hot water, and hot air; winds; ocean currents; freezing mixtures; animal heat; weather phenomena.

SYLLABUS OF ADVANCED COURSE.

1. Electricity and Magnetism: Statical charges; attraction and repulsion; two kinds of electrification; conductivity; insulation; induction; effect of points; lightning.

Magnets: Polarization; attraction and repulsion; magnetic induction; the magnetic needle; the dipping needle; the earth as a magnet.

Current Electricity: The battery cell; effects of the current on a magnetic needle; chemical action produced by the current; heat produced by the current; electro-magnets; electric measurements; induced currents.

Application of principles to the telegraph, the electric bell, the telephone, the storage battery, the arc light, the incandescent light, the dynamo, the electric motor, and electro-plating.

2. Sound: Production of sound; its transmission in solids, liquids, and gases; velocity of sound; reflection of sound; echoes; reinforcement of sound; interference; nodes and antinodes; forced and sympathetic vibrations; intensity, pitch, and quality of sound.

Application of principles to the vocal organs, the ear and acoustic instruments.

3. Light: Methods of comparing the illuminating powers of two

sources of light; explanation of images and shadows; umbra and penumbra; reflection of light; refraction of light; mirrors, prisms, and lenses; the spectrum; color; correlation of heat; light and chemical rays.

Application of principles to simple and compound microscopes, the telescope, the stereopticon, the eye, the rainbow, eclipses, phases of the moon, etc.

TEXT AND REFERENCE BOOKS.

Introduction to Physical Science. Gage. (Ginn & Co., New York and Boston.)

Physical Laboratory Manual. Chute. (D. C. Heath & Co., Boston.)

Physics by Experiment. Shaw. (Maynard, Merrill & Co., New York.)

English.

SYLLABUS OF ELEMENTARY COURSE.

1. The Sentence: Kinds, simple analysis and parsing.
2. Punctuation: Period, comma, etc., their use and application in written work.
3. Capitals: Use and continued application.
4. Parts of Speech. Kinds, uses and proper forms.
5. Proper Uses of Words: Much emphasis to insure habits of correct use of words in both written and spoken English.
6. Vocabulary: Its importance and acquisition.
7. Use of Dictionary.
8. Letter Writing and Correspondence: Chief points in a letter, letters of introduction, recommendation, application, etc., and general correspondence.
9. Written reproductions and paraphrasing.

SYLLABUS OF ADVANCED COURSE.

1. Study of the English sentence, different forms.
2. Analysis and parsing.
3. Written descriptions, compositions, and letter writing.

4. Formation of English words, stems, prefixes and suffixes.
5. Common errors in English, false syntax.
6. Clearness, unity, and strength in sentences.
7. Studies in choice literature and biography. For 1898-9, selections from the following authors are suggested: Whittier, Irving and Holmes. The individual production of an author should be studied in the light of his life and his times.

Throughout the course frequent exercises should be given in spelling, reading, interpretation and reproduction of various extracts and articles of standard English. The aim should constantly be to lead the student to habits of correct speech, the right use of words, an applied knowledge of practical business and commercial English, ready expression in correct and natural language, and to cultivate the ability to appreciate the refining influence of good reading. For success the work must all be intensely practical rather than technical.

TEXT AND REFERENCE BOOKS.

Practical Grammar and Correspondence. (Williams & Rogers, Rochester, N. Y.)

One Book Course in English. Reed & Kellogg. (Maynard, Merrill & Co., New York.)

Plain English. (Practical Text Book Co., Cleveland, Ohio.)

Association City Council.

SUPPLEMENTAL SYLLABUS FOR CLUB WORK IN CIVICS.

There is a growing conviction that young men should become intelligently acquainted with both the practical workings and the underlying principles of civic affairs—national, state and municipal. There is also need that they learn the moral fact that a vital relation should exist between civic righteousness and political life and business. The associations, with their large constituencies of young men and their educational facilities and methods, so readily adapted to the purpose in question, face a wide-open door of opportunity and a correspondingly large responsibility.

The following plan takes up municipal government. Its main features have been found eminently successful in several cities. Modifications may be made to suit local circumstances. It will be seen from the outline that it embodies at least a threefold purpose:

1. To gain a theoretical knowledge of civic and municipal administration.
2. To gain practice in the rules of parliamentary usage and public speaking.
3. To gain a knowledge of the city sociologically.

Thus it combines in a manner the good features of the Practical Talk, the Literary Society, the Present Day Problem Club, and the City Council in a single organization.

Meetings are held each week from October 1 to April 1. The club is formed from the members and takes on the form of organization similar to that of the city's governing body, with a person of experience, preferably a member of the board, acting as mayor or president, and a literary and elocution instructor, probably the teacher of English, serving as critic.

The first meetings are devoted to preliminary work and organization, after which a definite plan of instruction, discussion and training is followed. A lecture, paper or other form of presentation of an important matter, is followed by discussions and reformatory recommendations at the same or the next session.

The following is the suggested program:—

First Evening.

Why Study the Municipal System of Our City: Mismanagement of civic affairs due to indifference, ignorance and negligence; how it affects a community financially, hygienically and morally; special dangers in this city; what good government has done for other cities; duty of the Christian man in reform movements.

Second Evening.

History and Development of Local Municipal Institutions: Source and growth of municipal institutions; founding of the city; its growth and development; sources of its population; causes of its expansion; its incorporation, first charter and subsequent amendments; how and by whom the city charter is altered; the boundaries and divisions of the present city. Read pp. 98 to 166 in Small & Vincent's "Introduction to the Study of Society."

Third Evening.

The City Council, or Municipal Board: In former days; its present composition; qualifications for mayor and councilor; meetings of council; the council as a legislative body; the duties of the mayor;

the committees of the council; the executive department; the city officials; comparison of local system with that in vogue elsewhere.

FOURTH EVENING.

Association City Council: Organization; adoption of a constitution, by-laws, and rules of order; election of mayor, city clerk, city attorney, critic, and chairmen for the several committees, allotment of wards and seats.

FIFTH EVENING.

Paper: Municipal Finance and Taxation. (The treatment of this subject will vary so widely with each locality that no common outline is here attempted. The city treasurer or some well-informed local financier should be secured, if possible, to deal with this topic.)

SIXTH EVENING.

First Regular Session of the Association City Council: Business; discussion of a report drawn up by the finance committee recommending some alleged improvements in a matter affecting this department.

SEVENTH EVENING.

Paper: Our Streets and Parks. How the city is laid out; how streets are extended, widened, graded, paved, cleaned, and watered; the city parks and drives; the annual expenditure for these purposes; the officials of the department; terms upon which the street railway, electric light, gas, and other companies obtain the use of the streets.

EIGHTH EVENING.

Second Session of Council: Business; consideration of a report drawn up by the committee on streets and parks, upon some matter in their department which seems in need of improvement.

NINTH EVENING.

Paper: The Protection of Life and Property. The police force of early days; of to-day; the duties of the superintendent; the detective department; the patrol system; the police districts and station houses; annual cost of this department; how an offender is apprehended, tried, and convicted; the city jail; criminal statistics here and elsewhere.

TENTH EVENING.

Third Session of Council: Business; consideration of a report of police committee.

ELEVENTH EVENING.

Paper: Water Supply and Sewerage System. Early water system under private management; under civic ownership; design and construction of the present system; the equipment in machinery and plant; how the water is distributed throughout the city; how the department is managed; city by-laws upon these matters; annual expense, and how defrayed; the water rate here and elsewhere. The system of sewers and drains; the authority entrusted with their care. (*Map.*)

TWELFTH EVENING.

Fourth Session of Council: Business; consideration of a report from the water committee.

THIRTEENTH EVENING.

Paper: Fire Protection and the City's Light. Early volunteer fire brigades; the present force; apparatus in use; the alarm system; the fire commissioners and the fire committee; inspectors; expense of the department; fire insurance statistics. How and by whom the city is lighted; the expense and the terms of contract; comparison with other cities.

FOURTEENTH EVENING.

Fifth Session of Council: Business; discussion of a report from the fire and light committee.

FIFTEENTH EVENING.

Paper: The Public Health. Sanitary laws here and elsewhere; power and duties of health officers; infectious diseases; civic hospitals and cemeteries; the removal and disposal of garbage; annual expense.

SIXTEENTH EVENING.

Sixth session of council: Business; discussion of a report from the health committee.

SEVENTEENTH EVENING.

Sociological Study No. 1. A small committee, appointed several months previous, has made a careful examination of a selected district, perhaps a dozen blocks in extent. Regarding this they now present a report, accompanied by a map, treating of the following matters: The area of the district, whether business or residential. If business, the number, nature, size and location of the establishments contained therein; the number of persons employed; of men, of women, of children, the wages paid, etc. If residential, the number of persons living therein; the density per acre; average size of family; nationalities and religious beliefs. The number of families per building; average number of rooms to a family; of persons to a family and to a room; the number of school children and the school privileges; cases of overcrowding; the sanitary equipment of the homes. The rear tenements, their number and location; the average family income; the number of well-to-do families; number of poor; location of the slums. The rentals paid; proportion the rental takes of the earnings; the parks and their condition; the pavements, etc. The number and location of saloons and liquor groceries; the churches and their capacity; the various benevolent institutions and their work; the fire and police stations and the force at each.

The committee will then point out wherein the conditions are not as they should be and will recommend that certain reforms be undertaken.

EIGHTEENTH EVENING.

Seventh Session of Council: Business; discussion of sociological report No. 1, and of its recommendations for improvement.

NINETEENTH EVENING.

Sociological Study No. 2. (Presented on lines similar to No. 1, but treating of another district, of quite a different character, if possible.)

TWENTIETH EVENING.

Eighth Session of Council: Discussion of the above and of its recommendations for improvement.

TWENTY-FIRST EVENING.

Sociological Study No. 3 presented.

TWENTY-SECOND EVENING.

Ninth Session of Council: Discussion of the above and of its recommendations for improvement.

TWENTY-THIRD EVENING.

Paper: Municipal Elections and Duties of Young Men as Citizens.

Twenty-Fourth Evening.

Tenth Session of Council: Discussion of report from committee on elections.

Twenty-Fifth Evening.

Private members' night.

Twenty-Sixth Evening.

Annual Banquet.

It may seem wise for some associations to so adjust plans of the above course as to admit of a regular session of the council each week instead of on alternate weeks. This outline will admit of any such adjustment in order to hold the attention and accomplish the desired results.

TEXT AND HELPFUL REFERENCE BOOKS, PAMPHLETS AND PRINTED MATTER.

The City Charter.
The By-Laws of the City.
Rules of Order of the City Council.
Annual Reports of Departments. Printed forms, etc.
Municipal Government in Great Britain. Albert Shaw. (The Century Co.)
Municipal Government in Continental Europe. Albert Shaw. (The Century Co.)
Civil Government in the United States. John Fiske. (Houghton, Mifflin & Co.)
City Government in the United States. A. R. Conkling. (Appleton & Co.)
Municipal Problems. Goodnow. (Macmillan & Co.)
Municipalities at Work. Dolman. (Metheun & Co.)
An Introduction to the Study of Society. Small & Vincent. (American Book Co.)
Reports of Conferences for Good City Government. (National Municipal League.)
Municipal Year Book (1897). J. H. Wood. (Buffalo, N. Y.)

The Montreal Association, having pursued a similar course to the above, will supply copies of its literature gratis to other associations.

REGULATIONS FOR THE CONDUCT OF THE INTERNATIONAL EXAMINATIONS, 1899.

These regulations supersede all others and are subject to revision each year. It is necessary that each teacher and educational officer become thoroughly familiar with each step of the following requirements.

That this plan to establish and maintain a creditable standard of class work in the associations may reach its highest success it will be necessary for all to adhere strictly to both the *spirit* and *letter* of the regulations.

1. Supervision.

The general secretary, educational director, or some duly appointed officer shall have personal charge of the examinations, and be responsible for their arrangement and conduct.

2. Subjects.

The ground covered by the international examinations in each subject is comprehended in the syllabi of the subjects found in the Prospectus for 1898 on pages 10=40. The sets of examination questions given in the international examinations, April, 1898, may also be found on pages 56=91.

Commercial and Political.

Arithmetic, Bookkeeping, Civil and Municipal Government, Canadian Constitution, Association City Council, Business and Commercial Law.

Industrial Art.

Free-hand Drawing, Architectural Drawing, Mechanical Drawing, Carpentry, Applied Mechanics.

SCIENCE.

Electricity, Hygiene, including First Aid and Physiology, Algebra, Geometry, Physics and Chemistry.

LANGUAGE.

English.

The pointed suggestions, words of caution and advice from the international examiners, on pages 49 to 56 of the Prospectus for 1898, will be much appreciated by teachers and officers. Much improvement for our work the coming year will result in proportion as they are heeded.

3. Time—Simultaneous.

Associations desiring to avail themselves of these examinations should make their arrangements in accordance with the dates specified. *Examinations must be held on the dates and at the hours specified for each particular subject, otherwise the results cannot receive the attention of the international examiners.*

The examinations will be held during the week beginning Monday, April 3, 1899, for any three consecutive hours between 6 and 11 P. M. of each day, and according to the following classification, which must be strictly adhered to:—

Monday, April 3. Arithmetic, Electricity.

Tuesday, April 4. Bookkeeping, Carpentry, Geometry.

Wednesday, April 5. Free-hand Drawing, Civil and Municipal Government, Canadian Constitution, Algebra, Business and Commercial Law, Chemistry.

Thursday, April 6. Mechanical Drawing, Architectural Drawing.

Friday, April 7. English, Hygiene, Applied Mechanics.

Saturday, April 8. Association City Council, Physics.

Examinations in two or more subjects occurring on the same evening should preferably be held in different rooms.

Elementary and advanced examinations will be offered in each subject except Applied Mechanics. If both the elementary and advanced examinations are given in any subject, they must be given to *different* bodies of students, take place at the same hour, and, if possible, should occupy different rooms. A student is not permitted to take both the elementary and advanced examinations in a single subject the same year. The *maximum* time limit for the examination in each subject, either elementary or advanced, will be three hours. Any three consecutive hours —but only three—between 6 and 11 P. M. may be taken.

The class as a whole, or those who write on the examination, should begin at the same hour, say 7, 7:15, 7:30, or 8 o'clock, as agreed upon and announced beforehand. The time limit for writing would thus expire respectively at 10, 10:15, 10:30, or 11 o'clock. In no case should a student's paper which has occupied more than three hours in writing be sent to the committee.

4. How to Obtain Questions.

Requisition blanks, prepared for the purpose, will be sent each association reporting educational work, during the latter part of February, 1899. These should be filled out and returned as early as practicable, and by March 20, if possible. *Unless they are received by or before March 25, they cannot be accepted and filled.*

On this requisition blank order as many, *and only as many*, sets of questions, in each subject, elementary or advanced, as there are students who will undertake and actually write on the examination. *Each person to take the examination must have a separate set of questions for his own use. No two or more students are permitted to use a single set of questions.*

To cover cost of postage and the examination paper furnished by the committee, a charge of ten cents for each set of examination questions ordered is made. Send cash with the order.

5. Care of Questions.

The questions, in sealed envelopes, together with the necessary forms, class lists, record sheets, examination paper, program, etc., will be sent to associations making requisition as above, to reach them April 1-3. These envelopes must not be opened until in the presence of the class when seated ready for the examination. Before opening the envelopes the Special Instructions to Students, found at the close of these regulations, should be read aloud to the class.

6. Examination Paper.

The paper on which the students are to write their answers in the examinations is a specially prepared paper—letter size, about 8½x11 inches, containing all the necessary memoranda. Two double sheets of this paper for each set of questions ordered, is furnished to the associations without further expense than the ten cent fee charged for each set of questions. Use *only* this uniform paper in the examinations.

7. Writing.

The answers to questions should be written in *black ink*; drawings may be in pencil or crayon. *All* work in the examination—*not simply results*—exercises, computations, operations, etc., is to be put on the examination paper neatly and orderly. Leave one inch at left of each page for margin. The student must finish his paper, hand it to the person in charge and quietly leave the room at or before the time the examination closes. While three hours is the maximum time limit for examination, the average student thus far has finished his work in two and one-half hours.

8. Independent Work.

Each student must observe the Special Instructions to Students, work independently, relying on his own judgment as to both the meaning and answer of each question. No word of explanation or criticism of pupils' work will be allowed. No student may leave the room, after the examination has begun, and again be permitted to return to the room and continue his examination. *Two or more students are not allowed to use the same set of questions.*

9. Marking the Papers.

The teacher or person conducting the examination shall at its close see that the papers are promptly collected, guarded, and properly marked or graded, using therefor *red ink*. This marking should all be done within *two* or *three* days after the examination. *Each question* is to be marked in *red ink* and in the *margin*. Do not give simply one mark as a total for the paper. The value of each question, on the basis of one hundred for the entire number of *required questions* in the paper, is indicated by a figure in parentheses at its beginning. If the question is correctly and satisfactorily answered the result is entitled to receive this figure as its rate or grade mark. If the method of obtaining the answer is incorrect it should be marked zero. If partially correct rate proportionately. The sum of these marks or ratings will be the grade given by the association on the paper and should be put in *red ink* in its proper place at the head of the sheet of the International Committee's examination paper; also mark the grade on the class list (blank sent with the questions) in *red ink* in its proper place. The international examiners caution the teachers to be *more careful in estimating and mark-*

ing answers. No papers should be sent which in any way have transgressed any of the regulations governing the conduct of the examinations. The papers should be free from all remarks or comments by the teachers. Let the work of the student speak entirely for itself. The duplicate record sheets should both be properly filled out according to directions. One of them is to be kept by the association and the other returned with the papers to the International Committee as a part of the permanent records of the Educational Department.

10. How to Send the Papers.

Only those papers having a grade of seventy-five or more will be received at this office. The examination papers in each subject should be placed in a package by themselves, keeping the elementary and advanced papers in each subject separate. Place a properly filled Class List for each examination on the outside of the package and do not place the names of students taking elementary examinations on the same Class List with those taking the advanced; keep them distinct by using two Class Lists. Write these names alphabetically, and in *a plain hand—as the international certificates are engrossed from these lists of names.* The Class Lists should be filled out in every particular and *signed by the general secretary;* otherwise the papers cannot be accepted by the examiners.

The several smaller packages of papers from your association should be fastened in one larger package. Wrap securely, using straw board stiffening, keeping all papers flat. Send by express, prcpaid, to R. C. Morse, International Committee, 3 West 29th Street, New York. If the package is small it may be sent by mail. These results *should* all reach this office by April 20-22. *Such papers will not be accepted by the committce later than April 25.*

11. Certificates.

About June 1, or after the papers have been examined and graded by the international examiners, a report of the examinations and the number of those entitled to certificates will be sent to each association.

These certificates are furnished at one dollar each. They receive recognition at present (July, 1898,) in over sixty of the leading colleges and universities in America, and this number is increasing. On receipt of the cash order for the same, the individual certificates gained in each association will be mailed, in one package, to the general secretary.

SPECIAL INSTRUCTIONS TO THE STUDENTS

The following rules, some of which may appear elsewhere, relate to the conduct of the examinations and specially concern the students.

To make sure that the students thoroughly understand what they may do and what they are prohibited from doing, the following instructions, which may wisely be posted a few days beforehand, should be read to the class when seated for the examination and before the sealed envelope of questions is opened. *If the regulations are not heeded the papers cannot be accepted.* The certificate of the general secretary to the effect that these, and all other regulations governing the examinations for 1899, have been faithfully observed will be required for the acceptance of the students' papers by the international examiners.

1. The student is not permitted to have any books, notes, marks, or other helps in the examination.

2. He is not permitted to communicate with anyone in any way.

3. He must rely on his own judgment for the interpretation, meaning, and answer of each question.

4. *All work* as far as *possible*, unless otherwise specified, should be in *black ink*. Drawings and sketches for free-hand work, unless otherwise directed, may be in pencil or crayon; in elementary mechanical and architectural drawing the work may be in pencil, while in the advanced it should be mainly in ink

5. He will place the *number* of each question before its answer and confine his answer *strictly* to the question proposed.

6. He is not permitted to leave the room after the examination has begun and return again to continue his examination.

7. No student is permitted to write on the examinations unless he is furnished a set of questions *for his own individual use.* No two or more students are allowed to use the same single sheet or set of examination questions.

8. No student is allowed to occupy more than three hours on the examinations.

9. He will remain quietly at work within the time limit, or till he has finished his examination, or the time of closing has arrived. He will then deliver his papers to the person in charge and quietly leave the room.

10. A violation of any of the above requirements forfeits the right to the examination and no papers of such students shall in any case be sent to the International Committee, or received by them.

GENERAL SUGGESTIONS FROM THE INTERNATIONAL EXAMINERS.

The helpfulness of the suggestions of the international examiners last year was so vividly shown in the results of the present year that the following suggestions, and words of caution, advice and encouragement from the examiners, based on their experience in passing upon the nine hundred and sixteen papers of the recent examinations, will be read with an appreciative interest by all association officers and teachers. All that is said will be heeded with profit the coming year.

Arithmetic.

Supt. T. M. Balliet, Springfield, Mass., Examiner.

The papers show improvement over last year. Problems requiring simple mechanical operations were more generally correct than those requiring reasoning.

Some of the papers show plainly that pupils have been taught to work by rule instead of to reason out the processes involved. Some were exceedingly neat in appearance, many might easily have been prepared more neatly, and a few were inexcusably lacking in this respect.

Many students rightly stated the processes of reasoning by which the result was obtained instead of simply giving a brief statement of the results. This tendency should be strongly encouraged. An examination paper that gives no indication as to the method or way a given result is obtained is not of very much value.

Bookkeeping.

Frederick B. Schenck, President of Mercantile National Bank, New York, Examiner.

We gladly note an improvement in the neatness, order and penmanship of the papers this year over those of the past. In many of the papers, however, there was opportunity for more systematic, neat and orderly arrangement of the answers submitted. The requirements of a good bookkeeper should be constantly kept in mind. They are: First, accuracy; second, neatness; third, speed.

The students should place all their answers, and all the work in computations, discounts, etc., necessary for each answer, on the examination paper furnished by the committee. The teachers should be more careful in estimating value of answers, and mark *each* answer in *red ink*, and not give simply one figure for the total of a paper.

The aim of the work is to aid young men to become *practical* bookkeepers and *efficient* in the knowledge of accounts, and this aim should be kept continually in mind. It is therefore urged that the student in his course of training be led to give a sufficient reason for each step, in order to develop the ability to master the subject, and to take charge of an ordinary set of books.

The science of accounts should lead to concentration of thought.

Free-Hand Drawing.

W. S. Perry, Director, Art Department, Pratt Institute, Brooklyn, N. Y., Examiner.

1. The drawings are of much better size than last year. They should always be of such size as to properly fill the paper.
2. The quality of line needs still to be improved. It should be free, broad, and rather soft, not thin and wiry. Soft pencils may be used to advantage. The straight lines are *not* to be ruled.
3. More attention should be given to historic ornament, the simple elements of design, and to free-hand perspective. Special study should be given to the appreciation of finer curves in the historic ornament. Parallel perspective should never be used when one object is represented, except when that object is directly in front of the

eye. The old-fashioned parallel perspective is not used in progressive schools.

4. Instructors should record the per cent of each question, and in red ink. A statement should also be made whether the work is from cast or photograph.

5. Light and shade should be simpler in treatment.

9. Suggestions for materials for the study of perspective: Type solids and common objects based upon type solids, such as books, magazines, and vases of good and simple form.

7. Suggestions for materials for historic ornament and design: Sheets published by L. Prang, called "Parallel of Historic Ornament," plaster casts of historic ornament, Prang's Teachers' Manual, Part IV., and Jackson on Decorative Design.

Architectural Drawing.

A. D. F. Hamlin, Columbia University, New York, Examiner.

The associations, teachers and students are to be congratulated upon the encouraging improvement in the quality of the papers this year over those of last year. Evidently the teachers are appreciating the purpose and scope of the examinations, and are working towards a higher and more uniform standard of excellence. The following suggestions may promote still further improvement.

1. Too much care cannot be exercised by teachers as to the details of the examinations,—the time occupied in writing, which in no case can be over three hours; the time of closing the examinations, in no case later than 11 P. M.; and the collecting, guarding, and prompt marking of the papers in red ink. No papers should be sent to the committee which have in any way overstepped any of the regulations governing the conduct of the examinations. May I also suggest that the papers should be free from penciled remarks or comments by the teachers, and bear no marks other than the rating of each question in red ink. Let the papers speak for themselves.

2. Students should be trained to a careful scrutiny of, and compliance with the exact terms of each question. Omissions, errors of scale, and occasionally a total misapprehension of the question in a number of the papers of the last examination, indicated an inaccurate habit of mind.

3. In several cases correlated drawings, such as plans, and elevations, front and side views, sections and plans, etc., did not agree, or were placed out of line with each other. This is not only bad drawing but also evidence of lack of system and mental training; it is unworkmanlike and slovenly.

4. Many papers were deficient in neatness of lettering and workmanship. Simple, regular lettering and an orderly arrangement of the drawings should be insisted on. Never give the maximum rating when these are wanting.

5. As far as possible, all students in a class should follow the same course, whether they intend to be masons, carpenters or workers in other trades. Specialized instruction is neither practicable nor desirable under ordinary circumstances. Uniformity of work and discipline, above all in the elementary course, will tend to greater efficiency in the instruction. In the advanced course the study of the "orders of architecture" is desirable, not only for its artistic discipline, but because it furnishes a safe standard of proportion and detail for architectural composition of classic type.

While the lack of good elementary text books is unfortunate, teachers will find those recommended at the close of the syllabus, especially the first one mentioned, to cover in large measure the requirements of the course.

Mechanical Drawing.

C. R. Richards, Director of Manual Training, Teachers College, New York, Examiner.

It is strongly urged that all instruction in mechanical drawing be based upon the natural or third angle arrangement of views. That is, right side view at the right of the front view, top view above front view, etc. This method, which is the common practice in draughting rooms, has such great advantages in clearness and intelligibility for beginners that its universal use in the association classes is most urgently recommended.

Views should also be arranged in the simplest and clearest relation, that is, side view at the side of front view, and not at the side of top or plan view.

In the use of dimensions the papers showed improvement over last year. The use of a complete scheme of dimensions should be emphasized from the start. A working drawing is of no value unless it is fully accompanied by dimensions which show every fact of form.

The necessity for a few minutes of careful consideration of each problem on the part of the student, before the actual drawing is commenced, is exemplified in the results of the examinations of 1898. This fact was particularly emphasized in the case of the pattern development for the triangular pyramid. The habit of taking careful thought before proceeding with the drawing would have prevented the common mistake of taking either of the vertical dimensions shown upon the front view as a radius for the pattern of the sides. A hasty and superficial survey of the problem, however, allowed this mistake to be frequently made and prevented the true solution of the problem being reached.

The making of free-hand sketches from the object, containing all dimensions necessary to make a finished working drawing without further reference to the object, should be made a constant element of practice in the work.

Carpentry.

D. F. Graham, Association Training School, Examiner.

In examining the papers in carpentry, I noted that in a number of instances the students seemed to be unfamiliar with technical terms and expressions in practice, such as the movements required for the use of various tools, the names of tools and classes to which they belong, and of joints, splices, etc. More care should be given to this part of the subject by the teacher.

In some instances the students were evidently allowed to use machine tools in the construction of their models, which is certainly contrary to the spirit of the examinations. Rough, unplaned material is to be used in the construction exercises, and the student is to do all his own planing and sawing.

If the exercises are to be taken as a criterion of the work done, the instructors did not insist on that degree of accuracy required even in elementary schools, and far below that required by a school of higher grade. Nothing will compensate for inaccuracy in the workman.

The material from which some of the exercises were constructed was poor; the lumber was much thinner than the required size, which made it necessary for the students to waste considerable valuable time in joining several thicknesses together. Each association should see to it that lumber of various thicknesses is on hand before the evening of the examination.

Applied Mechanics.

C. R. Richards, Teachers College, New York, Examiner.

The important element to be sought for in the instruction in applied mechanics is a power of analysis and accuracy of thought, rather than a number of facts. Clear expression is an index of clear thinking, and the papers indicate that this quality should be emphasized and sought for above all others.

Hygiene;

Including First Aid and Physiology.

Luther Gulick, Association Training School, Examiner.

My suggestions and advice can best be given in the statement passed unanimously by the Physical Directors' Conferences of June, 1897, in response to a request from the educational committee for their views upon the courses and examinations in this subject:—

"We appreciate heartily the strong stand taken by the International Committee in the course of First Aid, Physiology and Hygiene, in making it of genuine aid to the pupil, rather than to pursue the conventional and less useful method of study in these subjects often followed.

"In our judgment the object of such course should be to give the student such knowledge of himself as will help him to be most successful in his daily life, and to be of service, where possible, to others.

"We suggest that the inductive method of instruction, proceeding from the known to the unknown, will secure far better results than the usual methods.

"In view of the fact that the physiology and hygiene of the reproductive system is usually regarded and treated in text books as a separate subject from physiology, and as this topic cannot be best treated except in its relation to the whole subject, we suggest that this topic be considered a regular part of the course and receive that degree of attention which is justified by its connection with the special problems of young men, and by its prominence in the whole of nature.

"In view of the importance of this matter, and also the fact that there is no text book at present covering these subjects as outlined, we suggest the advisability of there being prepared an extended outline, or a special text to follow the outline in this subject published by the International Committee.

"We recommend also that whenever practicable the physical director be the instructor in this subject, believing that it will result not only in strengthening the union of the educational and physical departments, but increase the opportunity of the physical director for reaching and helping men."

English.

Hamilton W. Mabie, The Outlook, New York, Examiner.

The papers are better than last year. Some of the suggestions made then have been wisely heeded, thus producing a better quality of result. While a few papers were neat and gave evidence of good form, fair use of English and correct expression of thought, yet the others revealed much carelessness, poor penmanship, and awkward expression.

Clear and correct expression is a measure of clear and correct thinking. Special attention to this matter is necessary.

There was a lack of the necessary reasons given for right corrections of the examples in faulty construction. Many illustrations of needed definitions were missing.

It is earnestly recommended that more careful attention of both teachers and students be given to these necessary details and all effort possible be given to impress the necessity of accuracy and proficiency in what may be called a primary knowledge of our own language. The work of associations in this direction is of great importance.

INTERNATIONAL EXAMINATION QUESTIONS
FOR 1898.

The following sets of questions used in the examinations of April, 1898, are given as an aid to the teacher in showing how the syllabi in the various subjects were covered in the last examination, and, approximately, how they are liable to be covered in succeeding examinations.

The number of credits for each question is given in parentheses following the number of the question. Credits allowed depend upon accuracy, expression of thought, neatness and order.

Work is to be done on paper of a uniform size, 8½x11 inches. One hundred credits is the total of a perfect paper; seventy-five credits are necessary for passing.

For the conduct of the examinations see pages 41 to 48 of this Prospectus. In order to give adequate opportunity and advantage to each student more than the necessary number of questions is given from which the student may select a certain required number.

Suggestive or sample sets of questions are given for the new subjects of Business and Commercial Law, Physics, and Chemistry.

INTERNATIONAL EXAMINATIONS, 1898.

ARITHMETIC.—Elementary.

MONDAY EVENING, *March 28, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Read all the problems before answering any of them. The student will select and answer any seven of the first eleven questions and any two of the remaining four, but* **no more.** *If more than nine questions are answered only the first nine answers will be considered.*

1. (10) The premium for insuring a house for three-fourths of its value, at 1¼%, is $150. What is its value?

2. (10) The reading of my gas meter January 1 was 11,840 cubic feet. The reading was 8,520 cubic feet at date of last settlement. At $2 per thousand feet, with a discount of 5% if paid within five days, what sum will settle the bill January 3?

3. (10) Find the interest on $850 for 6 years 2 months 13 days at 8%.

4. (10) Each of the two sides of a gable-roofed house is 42 feet long and 20½ feet wide. What will a tin roofing cost at $4.62½ per square? (A square in roofing is 100 square feet.)

5. (10) I own 30 shares of Building and Loan (sometimes called "Coöperative Bank") Stock upon which I pay 50 cents a share monthly. After paying for four years I draw out my shares and receive $936. What annual rate of interest do I receive?

6. (10) At 30 cents per hundred, what will be the cost of ice to a family that takes 40 pounds three times a week from April 1 to October 7?

7. (10) A due bill is given for $68.50, with interest at 7½%. To what will it amount if it runs 114 days?

8. (10) The successful candidate for mayor received 4,898 votes. His opponent had 3,002. Each candidate received what per cent of the entire vote?

9. (10) What will it cost to carpet a room 18 feet square with carpet ¾ yard wide, costing $1.15 per yard? Allow nine inches per strip for matching and turning under.

10. (10) Divide nine and eight-hundredths by five ten-thousandths, and from the quotient substract the dividend.

11. (10) On a bill of glass amounting to $654, a merchant was offered a discount of 30 and 5 by one house, and a discount of 34 by another. Thinking the former the better one, he accepted it. Did he gain or lose by so doing, and how much?

12. (15) What sum will to-day cancel a 5% note for $532, dated April 12, 1895, and maturing February 4, 1897? Describe the "6% method" of computing interest.

13. (15) A bookseller buys from the publishers a set of Scott's works listed at $17.50, at 40% discount. He then sells it at a discount of 20% from the same list price. What per cent does he make?

14. (15) If a tax of $364.80 is paid on a business block valued at $24,000, what is the valuation of a house and lot on which the tax is $129.20, at the same rate per cent?

15. (15) A desk cost $8. How shall it be marked that I may sell it at a discount of 20% from the marked price and still gain 20% on the cost?

INTERNATIONAL EXAMINATIONS, 1898.

ARITHMETIC.—Advanced.

MONDAY EVENING, *March 28, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE—*Read all the problems before answering any. The student will answer the first four questions, and any four of the remaining eleven questions, but* **no more**. *If more than eight problems are solved only the first eight answers will be considered.*

1. (15) A flag-staff 60 feet high stands in the center of a park 200 feet by 150 feet. What is the distance from the top of the staff to the middle of either side of the park? To the middle of either end?

2. (15) Bought 600 yards of silk at 95 cents a yard, and sold it at once, receiving in payment a 90 day note for $700. This I had discounted immediately at a bank at 6%. Find my gain. (No grace.)

3. (15) Which is the better investment, 5% bonds at 95, or 6% bonds at 102½, brokerage 1½% in each case? How much better?

4. (15) At 10 cents per square foot, what will it cost to line sides and bottom of a cubical bin which when two-thirds full contains 800 bushels of oats? (2,150.4 cubic inches in a bushel.)

5. (10) At what rate of interest will $7,500 in 3 years and 4 months amount to $8,625?

6. (10) If a man can lay $\frac{6}{11}$ of a wall in $2\frac{2}{3}$ days, how long will he be in finishing it?

7. (10) The following observations of temperature were recorded at a signal station for seven consecutive days at noon. 41° 29′; 41° 27½′; 39° 13′; 41° 33′; 37° 47½′; 44° 28′; 40° 13′. Required the mean average temperature for the week.

8. (10) It is noon by the sun on the "City of Paris." By the chronometer (Greenwich time) it is 21 minutes, 50 seconds past 3 o'clock P. M. In what longitude is the steamer?

9. (10) If from the retail price of a book 20 and 10 are deducted, and the book then sells for $1.08, what is the retail price? What single discount is equivalent to 20 and 10?

10. (10) Explain the relation between the meter and the units of capacity and weight used in the metric system.

11. (10) A park 80 rods square is surrounded by a walk 12 feet wide. How many cubic yards of gravel will it take to cover the walk to the depth of 5 inches?

12. (10) A tax collector pays over $121,568.46 and retains $1,476.54 as his commission. What per cent is allowed him for collecting?

13. (10) Find accurate interest on a United States $1,000 bond at 5%, from November 1, 1897, to April 10, 1898.

14. (10) An agent sold goods to the amount of $2,240, on 5% commission, and remitted proceeds by sight draft, bought at ¼% discount. Find face of the draft.

15. (10) A. and B., doing business together, find their stock to be worth $3,500, of which B. owns $2,100. They have gained 40 per cent on their first capital. What sum did each put in?

INTERNATIONAL EXAMINATIONS, 1898.

BOOKKEEPING.—Elementary.

TUESDAY EVENING, *March 29, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer the first seven, and any three of the remaining six questions. The student is invited to answer all of the thirteen questions, but if more than ten questions are answered only half the credits assigned to each of the last six questions will be allowed.*

1. (8) What is Bookkeeping and what is its purpose?

2. (9) Define debtor, creditor, and balance.

3. (8) What is a personal account, and what an impersonal account?

4. (6) What is the Proprietor's account, and by what other names is it known?

5. (12) Make out a debit and credit cash account showing $100 received by Henry Smith in five payments of $20 each per week; and expended in at least ten different amounts for household and personal items. Close the account and bring down a balance on hand of $4.75 carried forward for the following month.

6. (20) Make out the cash and ledger accounts showing the following transactions, viz.:—

Jan. 1. Richard Smith commenced business with $300 borrowed from his father, Thomas Smith, at 6% interest.
Jan. 10. Bought of William Jones 100 bbls. Flour, at $4 per bbl.
Jan. 11. Sold to John Brown 50 bbls. Flour, at $5 per bbl.
Jan. 15. Received from John Brown $100 cash on account.
Jan. 16. Paid to William Jones $50 cash on account.
Jan. 21. Received from John Brown $150 in full.

Jan. 25. Sold to Jas. Robinson 50 bbls. Flour at $6 per bbl.

Feb. 4. Received from Jas. Robinson $300 cash.

Feb. 5. Paid to Thomas Smith $300 for money borrowed.

Feb. 5. Paid to Thomas Smith $1.75 for interest.

Feb. 5. Paid to William Jones $350 for balance of account.

Close and rule off each of the above accounts and show Richard Smith's loss or gain.

7. (12) Make out a receipted Bill for the following merchandise sold:

William Reynolds, a dry goods merchant, has sold to Peter Jones:—

Jan. 11. 10¼ yds. Dress Goods, at $1.25 per yard.
5½ yds. Velvet, at $3.65 per yard.
21 yds. Sheeting, at 17c. per yard.
17⅛ yds. Silk, at $1.99 per yard.

8. (8) What is an inventory? Make an inventory of ten items in the grocery business.

9. (8) Write out a promissory note at six months for $475.21, dated Chicago and payable at a bank in New York City, with two endorsers.

10. (9) What is meant by the maker of a note? The payee? The endorser?

11. (8) What is meant by bills payable, and what by bills receivable?

12. (8) What is a bill book?

13. (8) For what purpose is a ledger balanced? How often should this be done?

INTERNATIONAL EXAMINATIONS, 1898.

BOOKKEEPING.—Advanced.

TUESDAY EVENING, *March 29, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE—*Answer the first seven, and any four of the remaining seven questions. The student is invited to answer all the fourteen questions, but if more than eleven questions are answered, only half the credits assigned to each of the last seven questions will be allowed.*

1. (5) What is meant by journalizing?

2. (8) Journalize the following:

October 15, 1897. James Brown and Henry Jones form a partnership. Brown contributes $4,500 in merchandise; a note of Smith & Co. for $600, and cash $900.

Jones contributes $7,500 in cash. He owes John Smith a note for $1,500, which the firm assumes to pay.

3. (5) Write a promissory note dated New Orleans, at 90 days from date, for $625, payable in Boston, Mass., with interest at 6% after maturity until paid, and of which Brown and Jones are makers and you are payee. Endorse and waive protest on same.

4. (15) Define acceptance; posting; trial balance; balance sheet; liability.

5. (12) Show the difference between single entry and double entry by posting the following according to each method:

Sept. 10. Sold to John Brown, Mdse. amounting to $200.

Sept. 15. Bought of James Smith, Mdse. amounting to $950, one-half cash and the balance in note at 3 months.

6. (12) Give directions for closing a double entry ledger, and show how to find from the ledger, the resources; liabilities; present worth, and net gain or loss.

7. (12) Find from the following ledger footings, the proprietor's net gain or loss, and his resources, liabilities, and net capital:

	DEBIT.	CREDIT.
Proprietor	$ 1,200	$ 5,000
Merchandise	10,231	13,295
Cash	5,316	4,320
Bills Payable	5,000	6,000
Bills Receivable, all good	2,790	1,560
Accts. Receivable, all good	9,163	8,175
Insurance	250	
Rent	1,000	
Interest and Discount	175	65
Wages	3,290	
	$38,415	$38,415

Inventory..........$2,120.

8. (8) Define the terms check; note; bill of exchange; bill of lading.

9. (8) Name four of the principal impersonal accounts frequently used in double entry bookkeeping. When is the interest account to be credited?

10. (8) Give a form for special column journal. What are the advantages of such a journal?

11. (8) How would you prove your bank pass book to be correct?

12. (8) What would be the discount at 5% per annum, calculated by days, on a note due June 30, 1897, for $560, and discounted Jan. 17, 1897.

13. (8) What cash and ledger records are necessary for a discount of the proprietor's own note?

14. (8) When is the bills receivable account to be credited, and when debited?

INTERNATIONAL EXAMINATIONS, 1898.

Civil and Municipal Government.—Elementary.

WEDNESDAY EVENING, *March 30, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer any ten questions but* **no more.** *If more than ten questions are answered only the first ten answers will be considered.*

1. (10) How are citizens of the United States defined by the Constitution?

2. (10) State the basis of representation (*a*) in the U. S. Senate, (*b*) in the House of Representatives. Why this difference?

3. (10) How is the President elected?

4. (10) What is the unit of local government in the New England States? In the Southern States? What system prevails in the Middle and Western States?

5. (10) How does a city obtain its right to maintain a city government?

6. (10) Define naturalization. State the conditions and steps necessary to secure it in this country.

7. (10) Distinguish between civil and political rights. Give examples.

8. (10) How are the United States Senators elected? For what length of term?

9. (10) Describe the organization of Congress.

10. (10) Mention the different grades of Federal Courts.

11. (10) Name by their official titles the members of the President's Cabinet.

12. (10) Explain the difference between local government and centralized government.

13. (10) Give some of the causes of bad city government in America.

14. (10) What are the municipal departments of the city in which you live?

15. (10) What can you say on the subject of municipal ownership of railways, gas works, electric light plants, etc.?

INTERNATIONAL EXAMINATIONS, 1898.

Civil and Municipal Government.—Advanced.

WEDNESDAY EVENING, *March 30, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer any ten questions but* **no more.** *If more than ten questions are answered only the first ten answers will be considered.*

1. (10) Describe the form of government that existed in this country during the revolutionary period, mentioning its principal defects.

2. (10) Name the departments of the executive branch of the United States Government and give the title of the head of each.

3. (10) What are the police powers of the state?

4. (10) Define local government. Mention the most important subjects of local control in the United States.

5. (10) Compare the *board system* and the *committee system* in city government.

6. (10) Mention five powers conferred on Congress and three restrictions imposed on Congress by the Constitution.

7. (10) State what you consider to be the true theory of the origin of government.

8. (10) If a person be falsely imprisoned, by what means can he obtain a release?

9. (10) How far is the right of suffrage regulated by state, and how far by federal law?

10. (10) What do you understand by the unwritten constitution?

11. (10) State the difference between a national bank note, a "greenback," and a silver certificate. Which of these is legal tender?

12. (10) Describe the main features of the national banking system.

13. (10) How does the city differ from other areas of local government?

14. (10) Discuss the advantages and disadvantages of municipal ownership of street railways.

15. (10) Define the powers of the mayor of the city in which you live.

INTERNATIONAL EXAMINATIONS, 1898.

FREE-HAND DRAWING.—Elementary.

WEDNESDAY EVENING, *March 30, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*The questions are divided into three groups. The student is required to select and answer one question, and only one, from each of the three groups. Only one answer from each group will be considered. Each question is entitled to 33 credits.*

Group I.

1. Illustrate by sketches some of the chief types of Egyptian ornament.
2. Make a sketch in outline of a Greek ornament from cast or photograph.
3. Make a drawing of a Roman rosettte.

Group II.

1. Draw in outline a group of cylindric and rectangular objects placed in front of and a little below the eye.
2. Make a sketch of any common object that combines cylindric and rectangular forms.
3. Draw in outline a group of objects, one of which shall be conical in form.

Group III.

1. Make a drawing from a simple cast.

2. Draw in outline a design for a border, using a Greek motive.

3. Draw in outline a design for a simple surface pattern, using an Egyptian motive.

INTERNATIONAL EXAMINATIONS, 1898.

FREE-HAND DRAWING.—Advanced.

WEDNESDAY EVENING, *March 30, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*The questions are divided into three groups. The student is required to select and answer one question, and only one, from each of the three groups. Only one answer from each group will be considered. Each question has 33 credits.*

Group I.

1. Make sketches illustrating Greek ornament.

2. Where are the best examples of Gothic architecture found? Sketch a Gothic detail.

3. What does the word Renaissance mean, and what are the characteristics of the style? Illustrate by drawings.

Group II.

1. Make a drawing of a corner of a room.

2. Draw in outline the appearance of a group containing two books and one cylindric object.

3. Make an outline drawing of a chair, desk or any other piece of furniture.

Group III.

1. Make a drawing from cast and indicate light and shade.

2. Draw a group of objects placed upon a table slightly below the level of the eye, and indicate the light and shade.

3. Make a drawing of fruit or foliage from nature, and indicate the light and shade.

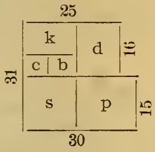
INTERNATIONAL EXAMINATIONS, 1898.

ARCHITECTURAL DRAWING.—Elementary.

THURSDAY EVENING, *March 31, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer questions 1, 2, and 3, and any three of the remaining questions, but* **no more.** *If more than six questions are answered only the first six answers will be considered. Neatness of execution is essential. Allow 80 minutes for question 1, and an average of 20 minutes for each of the others required.*

1. (25) Draw to the $\frac{1}{16}$-inch scale the ground floor plan of the frame cottage sketched in outline, with hall and stairs *s*, parlor *p*, dining room *d*, kitchen *k*, closet *c*, and back passage *b*. The figures indicate the chief dimensions in feet. Put in doors, windows, stairs and chimney where you think they belong, and also piazza if desired.



2. (15) Draw to the $\frac{1}{16}$-inch scale, the plan side elevation and end elevation of a roof, hipped or gabled, for the same cottage.

3. (15) Draw to the ¾-inch scale, the elevation and section of a door, showing paneling and trim.

4. (15) Draw to the ¼-inch scale, the plan and an elevation of a section of the stairs in the cottage of question 1.

5. (15) Sketch to the 1-inch scale an example in Flemish bond, 3 courses to be shown in elevation and one course in plan, for an 8½ inch wall.

6. (15) Sketch to any convenient scale, a section of the bottom of a frame building, showing sill, studs, joists and water-table.

7. (15) Draw to any convenient scale, the front, side, and plan of a simple dormer window.

8. (15) Draw, at 3 inches to the foot, the plan or a horizontal section of an ordinary window-jamb in a frame building, showing sash, boxing, weights, inner and outer trim.

9. (15) Draw to the same scale a section through the sill of the same window.

10. (15) Draw to the ¼-inch scale the joist-plan of one room of the cottage in question 1, showing how you would frame about a fire-

place and hearth. Indicate the names of the different sorts of beams employed.

11. (15) Draw to the 1-inch scale, the front and plan of the upper part of a brick chimney of two 8″ x 12″ flues.

INTERNATIONAL EXAMINATIONS, 1898.

ARCHITECTURAL DRAWING.—Advanced.

THURSDAY EVENING, *March 31, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer questions 1, 2-3, and 4; and any four of the remaining nine questions, but* **no more.** *If more than seven questions are thus answered, only the first seven answers will be considered.*

Neatness of workmanship and presentation, and accuracy of result are especially desired. The drawings may be executed either in pencil or in ink, or in both. In plans and sections the solids should be shaded or blacked in. An average allowance of 20 minutes for each question (40 minutes for 2-3) will enable the student to complete the examination required in less than three hours.

1. (15) Draw in plan and elevation a simple arch or doorway, 2 x 4 inches opening, flanked by two pilasters or columns of any desired order, carrying an entablature.

2-3. (30) Draw to the ⅛-inch scale the ground plan of a small frame cottage, having piazza, hall and stairs, parlor, dining-room and kitchen, with one or two fireplaces and necessary closets.

4. (15) Draw to the same scale one elevation of this cottage—either the front or side.

5. (10) Draw to the one-inch scale the details of construction of *sill*, *joists*, *foundation* and *water-table* of this cottage.

6. (10) Name the five orders and the principal parts of one of them from the base up.

7. (10) Define *footing*, *water-table*, *girder*, *truss*, *jack-rafter*, *English bond*, *sunk-girt*.

8. (10) Draw to ⅛-inch scale the side elevation and plan of a roof for a building 25 x 40 feet in plan, with a short ell, show gable, hips, dormer and chimney.

9. (10) Draw to ¾-inch scale the elevation and section of the front door of a cottage, 4 x 8 feet opening, upper part glazed.

10. (10) Sketch free-hand or with instruments, in perspective or in plan and section, the arrangement of the eaves and lower part of a roof on a stone building.

11. (10) Cast the shadow of a horizontal circle 1½ inches in diameter on a vertical wall.

12. (10) Draw an entablature and pediment of the Tuscan order, entablature being ¾-inch high and the building 4 inches wide, and cast the shadows upon it.

13. (10) Draw in plan and elevation, to the one-inch scale, the base and cap of a built-up steel column of any desired type—Phœnix, z-bar, channel-bar, lattice or other form.

INTERNATIONAL EXAMINATIONS, 1898.

MECHANICAL DRAWING.—Elementary.

THURSDAY EVENING, *March 31, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer any four of the first six questions and any two of the last four but* **no more.** *If more than six questions are answered only the first six answers will be considered.*

1. (15) Define, (*a*) section, (*b*) "draw to one-half scale," (*c*) working drawing, (*d*) plan and elevation.

2. (15) Draw the top, front, and right hand views of a triangular pyramid of which the altitude is 4″, and each side of base 2″. Have the front view show two faces.

3. (15) Draw two views of a piece of pipe 2¾″ in diameter, 4¼″ long, and having a bore of 1¾″. Show one-half in section.

4. (15) Draw the development of the figure in question 2.

5. (15) Draw to one-half scale, the development of a conical candle shade, with the diameter across the base of 6″, and across the top of 2″, and with a height of 3″.

6. (15) What is meant by the pitch of a screw thread? Show how V threads and square threads may be drawn conventionally.

7. (20) Draw a front view of a standard hexagonal nut for an 1½″ bolt, and also of a square nut for the same bolt, so that the character of the nut may be seen in this one view. Show chamfering.

8. (20) Draw the development of one side of a two-piece elbow, the diameter of the pipe being 2″ and the length of each piece, measured along the center line, being 1½″.

9. (20) Make a free-hand sketch of a two-step cone pulley, showing attachment to shaft by a set screw, that may be used as a working drawing.

10. (20) Make a working drawing of a mortise and tenon joint uniting two pieces, 1¼″ x 2″. Assume proportions of mortise.

INTERNATIONAL EXAMINATIONS, 1898.

MECHANICAL DRAWING.—Advanced.

THURSDAY EVENING, *March 31, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Make the drawing called for in question 1, the details of which are found on opposite page, and answer any two of the remaining four questions. Only three questions are required, and only three answers will be considered.*

1. (80) Make an assembly drawing of a stuffing box from accompanying details. Show a *section, and also one-half front view.* Draw to one-half scale. Put in all necessary dimensions. Make the drawing first in pencil and then finish carefully in ink.

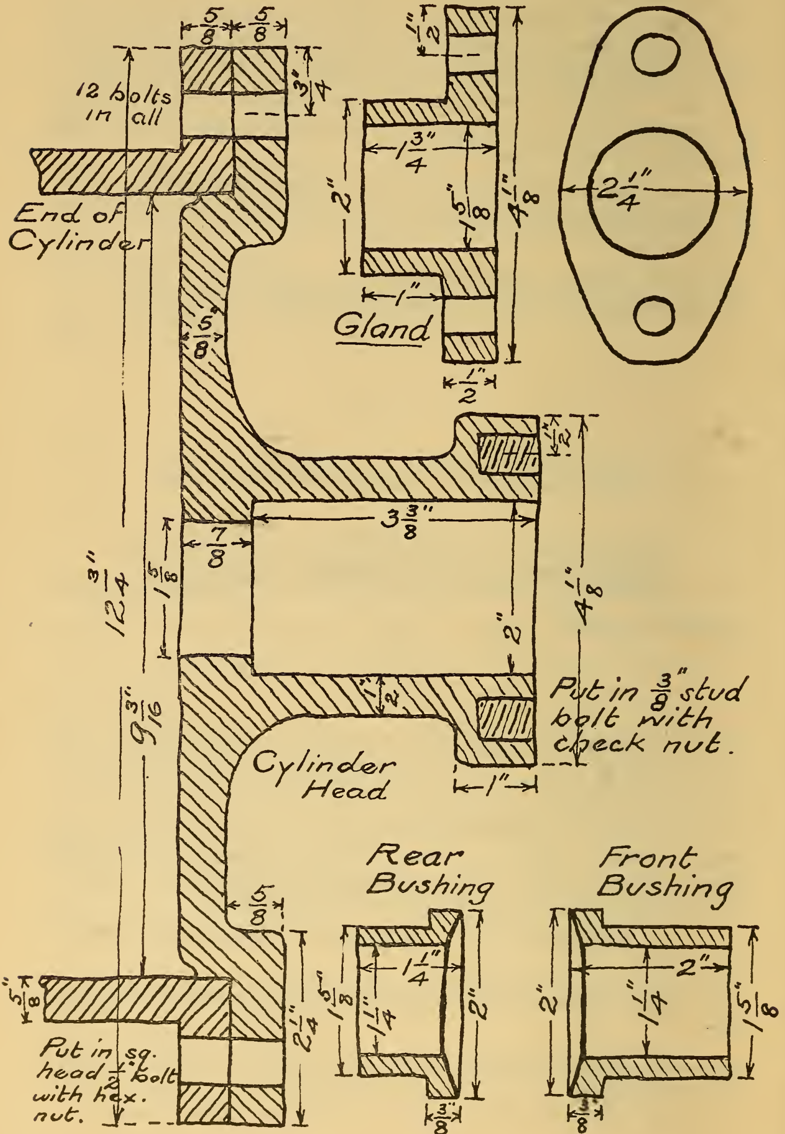
2. (10) Tell when such a stuffing box is useful and explain its use.

3. (10) Of what material are the bushings commonly made and why?

4. (10) Why are stud-bolts used to fasten the gland instead of ordinary bolts?

5. (10) What care is necessary in setting up such a gland?

To accompany question 1, Advanced Mechanical Drawing of International Examinations, 1898.



INTERNATIONAL EXAMINATIONS, 1898.

CARPENTRY.—Elementary.

TUESDAY EVENING, *March 29, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*The examination is both theoretical or written, and practical or constructive. The entire work, both the written and the constructive or shop work, must be finished in three hours. The student should allow from 60 to 80 minutes for the shop work part of the examination. Answer any five of the first seven questions, and either question 8 or 9, but* **no more.** *If more than six questions are answered only the first six answers will be considered.*

1. (15) Name five classes of wood working tools.

2. (15) What three movements are used in striking with the lighter tools, as hammer, mallet, etc.

3. (15) Name three kinds of cuts made by the knife or chisel.

4. (15) Would you sandpaper a board with or across the grain? Why?

5. (15) How would you set the bit of a plane, to smooth a piece of wood with knots in it?

6. (15) When planing the edge of a board how can you know when it is square with the side? And how can you keep it so from end to end?

7. In making an octagonal prism from a square prism what tools would you use?

8. (a) (10) Make a block 1½" x 3" x 6". Cut with saw accurately to line and leave rough without planing. (b) (20) Make a prism 2" square and 4" long. All angles to be true, sides and ends smooth. Put your name on each piece.

9. (30) Make an octagonal prism 2" in diameter and 4" long. All angles to be equal, sides and ends smooth. Put your name on each piece.

INTERNATIONAL EXAMINATIONS, 1898.

CARPENTRY.—Advanced.

TUESDAY EVENING, *March 29, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*This examination is both theoretical or written, and practical or constructive. The entire work, both the written and the constructive or shop work,* *must be finished in three hours. The student should allow from 60 to 80 minutes for the shop work part of the examination. Answer the first six questions and either one of the other two but* **no more.** *Only seven answers will be considered.*

1. (10) What is meant by wood working? Name twelve of the most common tools.

2. (10) If a piece when finished required to be 2″ square, what size should it be when cut from the plank with saw?

3. (10) What is known as a panel? In what does a raised panel differ from a flat panel? What is a bead?

4. (10) Name eight kinds of joints. Name eight kinds of splices.

5. (15) What do we mean when we speak of a housed joint?

6. (15) What are the advantages of a joint fastened by a wedge or key?

7. (30) Make a housed dovetail joint, from pieces 1½″ x 1½″ x 3″ and 1½″ x 1½″ x 4″.

8. (30) Make a keyed mortise and tenon joint from pieces 1½″ x 1½″ x 3″ and 1½″ x 1½″ x 4″. Make the key but do not drive tight. Put your name on each of the above pieces.

INTERNATIONAL EXAMINATIONS, 1898.

ALGEBRA.—Elementary.

WEDNESDAY EVENING, *March 30, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer any ten questions, including 2, 4, 6, 8, 10, 12 and 14, but* **no more.** *If more than ten questions are answered, only the first ten answers will be considered.*

1. (10) Evaluate $0.5x-\frac{0.45x-0.75}{0.6}-\frac{1.2}{0.2}+\frac{0.3x-0.6}{0.9}$, for $x=65$.

2. (10) Evaluate $\frac{x-a}{b}-\frac{x-b}{a}$, for $x=\frac{a^2}{a-b}$.

3. (10) Multiply $x^4-x^3y+x^2y^2-xy^3+y^4$ by $x-y$.

4. (10) Simplify $\frac{x^3+3x^2-4x}{7x^3-18x^2+6x+5}$.

5. (10) Find the lowest common multiple and highest common divisor of $6x^2-4x-2$, and $9x^3-27x+18$.

6. (10) Factor $6a^2-5ab-6b^2$; a^2-a-a^2b-ab; $6+x-x^2$.

7. (10) Divide $(x^2+7x+10)(x+3)$ by x^2+5x+6.

8. (10) Multiply $(a+3b)^2$ by $a^2-6ab+9b^2$.

9. (10) Solve, $\frac{a}{x-a}-\frac{b}{x-b}=\frac{a-b}{x-c}$.

10. (10) Solve, $\frac{0.3x-1}{0.5x-0.4}=\frac{0.5+1.2x}{2x-0.1}$.

11. (10) Solve, $\frac{x+1}{10}=\frac{3y-5}{2}=\frac{x-y}{8}$.

12. (10) Solve, $ax+by=a^2$: $bx+ay=b^2$.

13. (10) A takes 3 hours longer than B to walk 30 miles, but if he doubles his pace he takes 2 hours less time than B. Find their rates of walking.

14. (10) A certain number between 10 and 100 is 8 times the sum of its digits, and if 45 is subtracted from it the digits will be reversed. Find the number.

15. (10) Find the remainder on dividing $x^4+4x^3-x^2-16x-12$ by $x+6$.

INTERNATIONAL EXAMINATIONS, 1898.

ALGEBRA.—Advanced.

WEDNESDAY EVENING, *March 30, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer any ten questions, including 2, 3, 6, 7, 10, 13, 14, but* **no more.** *If more than ten questions are answered only the first ten answers will be considered.*

1. (10) Solve the equations: $2x+3y+4z=20$;
$3x+4y+5z=26$;
$3x+5y+6z=31$: by determinants.

2. (10) Solve the same system of equations without determinants.

3. (10) Expand $(a-2b)^5$ by the binomial formula.

4. (10) Find the value of $[\frac{1}{2}(e^x+e^{-x})]^2-[\frac{1}{2}(e^x-e^{-x})]^2$.

5. (10) Extract the square root of $1-4x+6x^2-4x^3+x^4$.

6. (10) Find the value of $\sqrt{2}\times\sqrt[3]{3}\times\sqrt[4]{4}$.

7. (10) Rationalize the denominator of $\dfrac{\sqrt{a+x}+\sqrt{a-x}}{\sqrt{a+x}-\sqrt{a-x}}$.

8. (10) What relation exists between $\sqrt{\sqrt{-1}}$ and $\dfrac{1+\sqrt{-1}}{\sqrt{2}}$?

9. (10) Give the sum and the product of the roots of:—

$$6x^2-5x+9=0;\quad 7x^2+11x+57=0.$$

10. (10) Solve, $x+y=5$;
$x^3+y^3=35$.

11. (10) Solve, $3x^2+165=16xy$;
$7xy+3y^2=132$.

12. (10) Solve, $x^4+y^4=82$;
$x-y=2$.

13. (10) A broker bought as many shares of stock as cost him $1875. He reserved 15, and sold the remainder for $1740, gaining $4 a share on the cost price. How many shares did he buy?

14. (10) Find the value of $\log\frac{11}{15}+\log\frac{490}{297}-2\log\frac{7}{9}$

15. (10) Examine for convergence, the series,

$$1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\frac{x^4}{4!}+\ldots \text{ where } 2!=1.2;\ 3!=1\cdot2\cdot3;\ 4!=1\cdot2\cdot3\cdot4, \text{ etc.}$$

INTERNATIONAL EXAMINATIONS, 1898.

PLANE GEOMETRY.

TUESDAY EVENING, *March 29, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer any ten questions, including 2, 4, 8, 9, 11, 13, 14, but* **no more.** *If more than ten questions are answered, only the first ten answers will be considered.*

1. (10) In what cases are two triangles congruent (equal in all respects)? Prove the theorem in one case.

2. (10) In what cases are two triangles similar? Prove the theorem in one case.

3. (10) Inscribe a circle in a triangle. Explain solution.

4. (10) What is the sum of the angles of a triangle? Prove it.

5. (10) Prove that the medians of a triangle are concurrent (meet in a point).

6. (10) What relation exists between the angles of an inscribed quadrilateral? Prove it.

7. (10) What relation exists between the sides of a circumscribed quadrilateral? Prove it.

8. (10) Construct a triangle equal (in area) to an irregular pentagon. Explain solution.

9. (10) Construct the mean proportional between two lines. Explain solution.

10. (10) A field is in the form of a rhombus, the obtuse angle being twice the acute. The shorter diagonal is 300 feet. Find the area of the field in square feet.

11. (10) From a point without a circle draw a tangent to the circle. Explain solution.

12. (10) On a given line as a side construct a trapezoid similar to a given trapezoid. Explain solution.

13. (10) Determine the area of a regular hexagon inscribed in a circle of radius 2 feet.

14. (10) If two chords intersect in a circle, what about their segments? Prove it.

15. (10) How are the areas of two similar polygons related? Prove it.

INTERNATIONAL EXAMINATIONS, 1898.

Hygiene, Physiology and First Aid.—Elementary.

FRIDAY EVENING, *April 1, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer the first five questions, and any five of the remaining ten questions, but* **no more.** *If more than ten questions are answered, only the first ten answers will be considered.*

1. (10) Describe treatment of a sprained ankle, and tell the reason for each procedure.

2. (10) Describe how the food materials get from the arteries to the muscle cells.

3. (10) Why does a small cut stop bleeding of itself after a time? Describe the process.

4. (10) Does exercise affect the rate of the pulse and of the breathing? If so, why?

5. (10) What are the differences between disinfectants, deodorants and antiseptics?

6. (10) What are tendons, what are they for, and how are they made up?

7. (10) What would you do for a man who had just cut the palm of his hand badly, the blood is spurting in jets from the cut?

8. (10) Why should food be well chewed?

9. (10) How does the food get from the alimentary canal into the blood?

10. (10) How would you distinguish cases of intoxication and fainting from each other?

11. (10) Describe treatment of a large but not deep burn on the arm. The skin is not broken.

12. (10) What would you do with one who was apparently drowned?

13. (10) A man is faint from a blow in the pit of the stomach. What would you do for him till the doctor comes?

14. (10) How would you try to carry a person out of a burning building alone?

15. (10) Describe the nervous and muscular elements involved in a muscular movement.

INTERNATIONAL EXAMINATIONS, 1898.

Hygiene, Physiology and First Aid.—Advanced.

FRIDAY EVENING, *April 1, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer the first five questions, and any five of the remaining ten questions, but* **no more.** *If more than ten questions are answered, only the first ten answers will be considered.*

1. (10) Does respiration affect circulation? If so, how and to what extent?

2. (10) What is the marrow in the bones for? What organs in the body, if any, have similar functions?

3. (10) Could one live readily on oatmeal, sugar, and a quart of milk a day? If not, why not?

4. (10) Tell all you can about nocturnal seminal emissions.

5. (10) Compare the effects upon the heart and kidneys of coffee, tobacco and beer.

6. (10) In what way does exercise affect the development of the central nervous system?

7. (10) What is a peptone?

8. (10) What is the mechanism by which exercise affects the circulation: (*a*) a muscle; (*b*) the liver; (*c*) the brain?

9. (10) Compare effects of a long warm bath and a short cold one upon the skin, muscles, heart, lungs, nervous system.

10. (10) Is bodily vigor and health important from a moral standpoint?

11. (10) Compare the effects of constant thinking of licentious matters but without action, and of licentious habits of action.

12. (10) Why should the streets be kept clean?

13. (10) What diseases are peculiarly liable to be caused by absence of a sewage system in a city?

14. (10) Are there laws in your state in regard to inspection of meats, butter, milk, etc.? If possible, give the gist of them. Are they enforced? Give an instance.

15. (10) Describe all the effects of forced deep breathing for five minutes.

INTERNATIONAL EXAMINATIONS, 1898.

ELECTRICITY.—Elementary.

MONDAY EVENING, *March 28, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer any ten questions, but* **no more.** *If more than ten questions are answered, only the first ten answers will be considered.*

1. (10) Distinguish between an electric charge and an electric current.

2. (10) Define the intake, output, and efficiency of a machine.

3. (10) What is the name of the practical unit of E. M. F.? How is it related to the practical units of current and resistance?

4. (10) State how the resistance of a conductor is influenced by the nature of its material, by its length, and by its area of cross-section.

5. (10) What do you understand by the polarization of a voltaic cell? How are the effects of polarization avoided?

6. (10) Distinguish between resistance and resistivity.

7. (10) Eight (8) voltaic cells, each having an E. M. F. of 2 volts and an internal resistance of 3 ohms, are connected in series, and the battery so formed is short-circuited. What will be the current strength passing through the short-circuited battery?

8. (10) Describe in full the construction of a Leclanché voltaic cell.

9. (10) Distinguish between electromotive force and magnetomotive force.

10. (10) Draw an analogy between the voltaic and the magnetic circuit.

11. (10) Describe the construction of a step-down transformer. What advantage is obtained by its use in the transmission of electric power?

12. (10) In what ways is the heat generated in the armature of a dynamo-electric machine thrown off or dissipated?

13. (10) Explain the manner in which the commutator of a dynamo operates, and its purpose.

14. (10) What effect is produced on the speed of a shunt motor by decreasing the strength of the current passing through the shunt field?

15. (10) Describe the component parts of an incandescent lamp.

INTERNATIONAL EXAMINATIONS, 1898.

ELECTRICITY.—Advanced.

MONDAY EVENING, *March 28, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer any ten questions, but* **no more.** *If more than ten questions are answered, only the first ten answers will be considered.*

1. (10) What is the numerical relation between the C. G. S. unit

of resistance and the practical unit of resistance? How much energy will be expended by a current strength of one ampere passing through the C. G. S. unit of resistance during one second?

2. (10) Three resistances of 10, 20 and 30 ohms respectively are connected in parallel. What is their joint resistance?

3. (10) Explain in detail the use and nature of the Wheatstone bridge for determining electric resistances.

4. (10) What is the value of the resistivity of copper? Assuming this resistivity, what will be the resistance of a cylindrical wire of this material one mile long and one-tenth of an inch in diameter?

5. (10) Explain by the aid of a hysteretic diagram what you understand by the term magnetic hysteresis.

6. (10) Show by means of diagrams the difference between a series-wound, a shunt-wound, and a compound-wound generator.

7. (10) Name all the factors upon which the E. M. F. generated by the armature of a dynamo-electric machine depends, and give a numerical example showing the application of these factors.

8. (10) What is meant by the torque of a motor? Upon what does its magnitude depend?

9. (10) Describe the construction and operation of a polyphase motor.

10. (10) How is the value of the International ampere determined in practice? Define it.

11. (10) What a kilowatt? What is a kilowatt-hour?

12. (10) The internal resistance of a voltaic battery is 2 ohms, and its E. M. F. 20 volts. It is directly connected to an electro-magnet of 3 ohms resistance by means of long mains of 5 ohms resistance. Show by means of a diagram the potential difference at different points in the circuit thus established.

13. (10) A generator received 200 horse-power from its engine, its efficiency being 92%. It is directly connected, by short, thick conductors, to a motor which gives 168 mechanical horse-power at a speed of 600 revolutions per minute. What is the efficiency of the motor, and of the electric plant, and what is the torque of the motor while delivering this power?

14. (10) Explain in full why it is necessary to provide a starting rheostat for insertion in the armature circuit of a shunt-wound motor.

15. (10) An alternating-current transformer delivers a current of 100 amperes at a pressure of 110 volts measured at its terminals. The

transformer has an efficiency of 95%, and a power factor of 99%. What will be the power delivered to the transformer, and what will be the current strength if the pressure at the primary terminals is 1,000 volts?

INTERNATIONAL EXAMINATIONS, 1898.

APPLIED MECHANICS.—Elementary.

FRIDAY EVENING, *April 1, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*The first five questions, and the student's choice of any other five of the remaining ten questions, are required. If more than ten questions are answered, only the first ten answers will be considered.*

1. (10) What is a machine? How is the efficiency of a machine calculated?

2. (10) State the law of the lever. Describe the three classes of levers.

3. (10) State the difference between force, work and power.

4. (10) State the law governing centrifugal force.

5. (10) What is the coefficient of friction? State the laws of friction.

6. (10) It takes 16⅔ lbs. at the circumference of a wheel to balance a bucket of water weighing 50 lbs. suspended from an axis 8 inches in diameter. What is the diameter of the wheel?

7. (10) How many pounds will a screw of four threads to the inch sustain when 45 lbs. are applied at the end of a lever 14 inches long?

8. (10) If a force of 6 lbs. acts directly downward upon a body and another force of 8 lbs. horizontally, what will be the amount and direction of the resultant? Indicate by sketch.

9. (10) If a body weighing 193 lbs. moving at a velocity of 20 feet per second is opposed by a uniform resistance of 800 lbs., through what space will the resistance be overcome?

10. (10) A horse, walking at the rate of three miles an hour, draws a load of 150 lbs. up a shaft by means of a rope passing over a pulley. Estimate in foot-pounds the work done in one minute.

11. (10) A steam engine supplies 500 houses with 1,000 lbs. of water each, working 12 hours per day. If the average height to which the water is raised is 80 feet, at what horse power does the engine work?

12. (10) There is an unbalanced mass of 1 lb. in the rim of a fly-wheel 3½ feet in diameter rotating at a speed of 300 revolutions per minute. What pull upon the shaft does the unbalanced mass produce?

13. (10) What should be the cross section area of a wrought iron bar so as to carry a tension of 13,200 lbs. with a factor of safety of 5?

14. (10) What pressure is needed to punch a hole 1 inch square through a wrought iron plate ¼ inch thick?

15. (10) A bar 1 inch square and 2 inches long elongates .0004 inches under a tension of 5,000 lbs. Compute the modulus of elasticity.

INTERNATIONAL EXAMINATIONS, 1898.

ENGLISH.—Elementary.

FRIDAY EVENING, *April 1, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer any ten questions, but* **no more.** *If any more than ten questions are answered only the first ten answers will be considered.*

1. (10) Write the following sentence with the proper capitals and punctuation marks and give the reason for each.

friends romans countryman Lend
me your Ears i come to bury
cæsar not to praise Him

2. (10) Give the plural of *wolf*, *fox*, *beau*, *axis*, *cupful.* Give one example each of (*a*) nouns which form their plural without ending in *s*, (*b*) singular nouns which have no plural form, (*c*) plural nouns which have no singular form.

3. (10) Give the masculine of *lass*, *ewe*, *duck;* the feminine of *wizard*, *king*, *monk.*

4. (10) Give the principal parts of *go*, *do*, *lay*, *ride*, *fly*, *set*, *draw.*

5. (10) *Define* and give an example of (*a*) an imperative sentence; (*b*) a collective noun; (*c*) an interrogative pronoun; (*d*) an irregular intransitive verb.

6. (10) Give the *case*, *number* and *person* of the following pronouns: *my*, *him*, *us*, *them*, *he*, *we*, *his*, *thou*.

7. (10) Write the possessive singular, and the possessive plural of *step-mother*, *wife*, *salesman*, *goose*.

8. (10) Decline *I* and *he* in both singular and plural. Write the nominative plural of *who* and *it;* the objective plural of *which*.

9. (10) Compare *worse*, *least*, *much*, *upper*, *last*, *delightful*.

10. (10) Classify the following sentences according to both *use* and *form*.

(*a*) They also serve who only stand and wait.
(*b*) Remain where you are till I return.
(*c*) Good habits are most easily formed in youth.

11. (10) Analyze or diagram the three sentences in question 10.

12. (10) Correct the following sentences and give the reason for each correction.

(*a*) He don't know what to do.
(*b*) I cannot tell who done it.
(*c*) We shall soon become as poor as them.
(*d*) Let everyone please themselves.
(*e*) I hope that he shall return to-morrow.

13. (10) Write a brief letter to your teacher inviting him to join in an excursion you are arranging. Be careful about punctuation and the arrangement of the parts of the letter.

14. (10) Translate the following abbreviations: A. M., lb., LL.D., Ph. D. Give abbreviations for the following: Bachelor of Arts, Anno Domini, Take Notice.

15. (10) With care as to punctuation, spelling, capitalization and proper use of words, write your thoughts to the extent of 100 words at least on either of the following topics: *The work of our evening classes; The educational needs of the city in which I live.*

INTERNATIONAL EXAMINATIONS, 1898.

ENGLISH.—Advanced.

FRIDAY EVENING, *April 1, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*Answer any ten questions, but* **no more.** *If more than ten questions are answered, only the first ten answers will be considered.*

"*Now fades* the glimmering landscape on the sight,
And all the air a solemn stillness *holds*,
Save where the beetle wheels his droning flight,
And drowsy tinklings lull the distant fold."

1. (10) Analyze or diagram the above sentence.

2. (10) Parse the italicized words in above sentence.

3. (10) Give three sentences illustrating the three kinds of *form*, and four sentences illustrating the four kinds of *use*, into which sentences are usually classified.

4. (10) Correct the following sentences and give the reason for each correction: (*a*) Of what gender are each of the following nouns? (*b*) It is easier said than done. (*c*) It could not have been him. (*d*) When will we do this? (*e*) I think this is the best of the two.

5. (10) Write a short account, containing 50 or more words, for a newspaper notice of the international examinations now being held.

6. (10) Define the following words and give the meaning of each stem: *tangible*, *majority*. Give the meaning of the prefixes *extra*, *super*.

7. (10) Correct the following sentences and give reasons: (*a*) He acted much wiser than the others. (*b*) Everyone must bear their own burdens. (*c*) Washington was greater than any American. (*d*) I meant to have written to you last week. (*e*) To profess regard and act differently mark a base mind.

8. (10) Parse the italicized words in the following:

(*a*) After the *reading* of the paper he left.
(*b*) After *reading* the paper he left.
(*c*) *Having read* the paper he left.

9. (10) Write a brief biographical sketch, 50 words or more, of a man named A, whom you consider your ideal. Describe his character.

10. What books have you read during the past twelve months? What helpful suggestions have you obtained from them? From which two books have you gained most, and why?

11. (10) Give three rules for the use of capital letters, three for the use of the period, and two for the use of the comma. Illustrate each rule by an example.

12. (10) Give *five* uses of the objective case and illustrate each by an example.

13. (10) Write the first person plural of all the tenses of the indicative and potential modes of the verb *do*, giving the name of each tense.

14. (10) Write a short account of not less than 150 words on one of the following topics: *Educational facilities of our city; How can we improve our Libraries; The International Examinations.* Be careful about spelling, punctuation, capitals, and proper use of words.

INTERNATIONAL EXAMINATIONS, 1898.

ASSOCIATION CITY COUNCIL.

SATURDAY EVENING, *April 2, 1898, for three hours, between 6 and 10:30 o'clock.*

NOTE.—*The pupil will choose and answer ten questions but* **no more.** *If more than ten questions are answered only the first ten answers will be considered.*

1. (10) In what year did your city become a city? What legislative authority gave to it a charter? How may this charter be altered when necessary?

2. (10) What are the legal qualifications requisite for Alderman or Councilor? Of whom is the City Council or Municipal Board composed? Has the Mayor power to veto a By-law approved by a majority of the Council?

3. (10) Upon what principle is it permissible for a municipal corporation to borrow money? What are "Municipal Bonds," and how is a civic loan "floated?" What rate of interest is payable upon the last bonds floated by this city? At what figure are these bonds now quoted in the local stock market?

4. (10) In round numbers give the annual income and expenditure of your city. What are the three main sources of revenue? What are the three principal items of annual expenditure?

5. (10) What is the population of your city? Give approximately the proportions of the five most numerous nationalities. What percentage of the inhabitants are Protestants? Roman Catholic? Jewish?

6. (10) Tell what you can in ten lines regarding the Police Department: How is it governed? Who is its chief? Into how many precincts is the city divided? How many men are there on the force?

7. 10. Give the terms under which *one* municipal monopoly (such as elevated railway, surface cars, light, telephone) has received a franchise from the city, and show wherein a more favorable arrangement for the city might have been made.

8. (10) What is the source of your city's water supply? How many miles has it to be brought to the city? From what point or points is it distributed? At what rates is the water, used in a private house, paid for?

9. (10) If a citizen sees a saloon open at illegal hours, or one in which liquor is being sold to minors, what course is open to him to bring about the punishment of the offending saloon keeper for infraction of the law?

10. (10) Under what control are your public schools? By whom are the local authorities appointed? How would you suggest that the system might be improved?

11. (10) Under what streets are the main sewers of the city? Where do they discharge? What use is elsewhere made of a city's refuse?

12. (10) How is an outlying piece of territory annexed to the city?

13. (10) Take a section of the city with which you are familiar and give from memory its main characteristics. State wherein the municipal authorities might add to health, comfort or morality of this section.

14. (10) Give five different ways in which the municipal administration, if badly conducted, may injure a community.

15. (10) If you are a municipal elector, state how you are qualiified as such. If you are not an elector, how may you become one? If a name has been, by error, omitted from the electoral list, how, when and where may this mistake be rectified?

SUGGESTIVE EXAMINATION QUESTIONS.

BUSINESS AND COMMERCIAL LAW.—Elementary.

1. How is legal science to be distinguished from ethics?

2. Do courts in construing contracts go beyond the intent of the parties?

3. What classes of persons are regarded by the common law as incompetent to contract?

4. How far is a parent bound to support his child, and a husband his wife?

5. When is a master bound by the acts of his agent or servant?

6. If a man wishes to sell a piano on installments and deliver possession to the purchaser, how can he secure payment of the purchase money?

7. The payee of a note endorses it and delivers the same to a creditor in settlement of an antecedent debt. Does the indorsee become a *bona fide* holder for value?

8. When a member of a partnership dies can the widow take his place in the business? Does she have dower in the partnership land?

9. How are corporations for trade and manufacture organized?

10. To what extent is a stockholder of a corporation liable for losses?

SUGGESTIVE EXAMINATION QUESTIONS.

BUSINESS AND COMMERCIAL LAW.—Advanced.

1. What business transactions does the law require to be in writing?

2. May a last will and testament be oral?

3. What authority has an executor over the real estate of the decedent?

4. May one compel another business man to trade with him and sell him goods?

5. A New York merchant's goods are damaged by a railroad accident in Illinois. How can the New York man prove this fact in court?

6. Has a ship-chandler, who furnishes repairs and supplies and charges them to the ship itself, a lien on the vessel?

7. Is a deed of land valid if not put on record?

8. A man buys goods on credit, never intending to pay for them. He sends the goods to an auction house. How can the seller proceed to secure himself?

9. Can an insurance policy be transferred by assignment?

10. Distinguish warranty from guaranty.

11. A man is discharged from his debts under a New York insolvency law. Does this prevent a creditor in New Jersey from suing?

12. A man writes on a telegraph blank, "Shoot the Mayor on sight." Should the company send such a message?

SUGGESTIVE EXAMINATION QUESTIONS.

PHYSICS.—Elementary.

1. Explain how it is that snow protects vegetation in winter. Will wrapping a thermometer in woolen make it warmer? Why then do woolen blankets keep the body warm?

2. How do large bodies of water modify the climate about them? Explain.

3. Why is it warmer in the center of a storm than in its outskirts?

4. Why does the skin feel cold when moistened with alcohol? Why does it feel cooler after being moistened with warm water than with cold water?

5. Why does a mixture of ice and salt freeze water, and why does the ice liquefy at the same time?

6. A cubic foot of ice weighing 56¼ lbs. is floating in water and

one-tenth of its volume rises above the surface of the water. Show how you may compute from this the weight of a cubic foot of water.

7. Granite is about two and one-half times as heavy as water; how much would you be obliged to lift while holding a cubic foot of it submerged in water?

8. Suppose a body weighing 10 lbs. moves under the influence of a constant force 20 ft. the first second, 60 ft. the next second, and 100 ft. the third second, how far will it move the fourth second? How does its momentum at the end of the fourth second compare with that at the end of the second second? Explain your method of calculation.

9. Explain why a stream of water falling freely tends to separate into drops.

10. In a certain wheel and axle the diameter of the wheel is 4 ft. and that of the axle is 1 ft. It is found that a weight of 160 lbs. attached to the rope which encircles the wheel is necessary to lift a weight of 600 lbs. attached to the rope which encircles the axle. How much work must a man do to lift the 600 lbs. a distance of 2 ft. with this machine? How much work would he need to do to lift it without the machine?

SUGGESTIVE EXAMINATION QUESTIONS.

PHYSICS.—Advanced.

1. With a permanent magnet explain how you would magnetize a sewing needle so that its point would repel the north end of a compass needle.

2. How would you accomplish the same thing, using instead of the permanent magnet, insulated wire connected with a battery cell?

3. How may you, with a stick of sealing wax, electrify one pith ball positively and the other negatively?

4. Draw a diagram of an electric bell and show how an electric current operates it.

5. Show how an electric bell may be used to give a shock.

6. Distinguish between pitch and loudness of sound.

7. If two vibrating strings are alike in all respects, except that one is twice as long as the other, how do their tones differ in pitch? Answer the question in case they are the same length, but one has twice the diameter of the other.

8. Draw a diagram and explain how a curved mirror may give an inverted image.

9. Draw a diagram and explain how ripples upon the surface of water prevent one from seeing objects submerged in it.

10. Draw a diagram and explain how a tumbler of water may magnify things seen through it.

SUGGESTIVE EXAMINATION QUESTIONS.

CHEMISTRY.—Elementary.

1. A test-tube six inches long and filled with air is inverted over water. Suppose we allow phosphorus to rust for several days in this enclosed air. (*a*) How high will the water rise? Show how you would compute the percentage of nitrogen and of oxygen in the air from this measurement. (*b*) Suppose at the end of several days we direct a flame toward this test-tube until the phosphorus melts, will it burn or rust? What would happen if we should remove the test-tube while the phosphorus is thus hot? (*c*) If any chemical action should take place, write the equation which represents it.

2. Describe experiments which prove: (*a*) That water is composed of hydrogen and oxygen; (*b*) that it contains no other element; (*c*) that it contains twice as much hydrogen as oxygen by volume.

3. If a litre of hydrogen weighs .089578 grams and a litre of oxygen weighs 1.429 grams, what is their proportion by weight in water? A litre of water weighs 100 grams, how many grams of hydrogen and oxygen does it contain? How many litres of each?

4. Given a burning candle and a dry tumbler. How would you prove that there is hydrogen in the candle?

5. What may we infer with regard to the chemical properties of

chlorine from the fact that "chlorine of lime" acts as a bleaching and a disinfecting agent?

6. Into a flask put a little common salt and pour upon it a few drops of sulphuric acid. Write the equation that expresses the reaction that takes place. Hold a piece of litmus paper at the mouth of the flask. Add to the contents of the flask a little manganese dioxide and a little more sulphuric acid if necessary. Now bring the litmus paper to the mouth of the flask. Explain what has taken place during the experiment.

SUGGESTIVE EXAMINATION QUESTIONS.

CHEMISTRY.—Advanced.

1. If oxygen makes things burn, how do you explain the following? Carbon dioxide is nearly three-quarters oxygen while air is only about one-fifth oxygen, yet things burn readily in air and do not burn in carbon dioxide.

2. Mention a number of sources from which carbon dioxide is supplied to the atmosphere, and explain how its ratio to other ingredients of the air is kept about constant.

3. Explain the use of carbon in extracting metals from their ores.

4. Describe an experiment to show the presence of carbon in alcohol.

5. Why is there frequently a sudden burst of flame on a coal fire when the upper furnace door is opened? What are some of the products formed by this combustion?

6. Can the chemist increase or diminish the amount of carbon dioxide in the world? Can he increase or diminish the amount of carbon? Explain.

7. How do we prove that diamond is carbon?

8. Given ammonium nitrate, sodium chloride, sulphuric acid, and potassium hydroxide. (*a*) How would you distinguish between the salts? (*b*) How would you produce from these nitric acid, hydrochloric acid, sodium sulphate, potassium sulphate, ammonia, potas-

sium nitrate, and ammonium sulphate? (*c*) Write the equations which express each of the above reactions.

9. Into a test-tube put a little chalk and pour upon it some hydrochloric acid. Write an equation expressing the reaction that takes place. Pass some of the gas which is being generated into another test-tube containing a little lime water. Write the equation expressing the reaction that now takes place. Note a few familiar and interesting facts concerning the gas.

10. How would you make hard water? How would you soften the water again?

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